



GOVERNMENT OF THE  
CENTRAL PROVINCES AND BERAR



**REPORT**  
OF THE  
**PROVINCIAL INDUSTRIES COMMITTEE**  
**CENTRAL PROVINCES & BERAR**

NAGPUR  
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## REPORT OF THE CENTRAL PROVINCES AND BERAR PROVINCIAL INDUSTRIES COMMITTEE

### CHAPTER I.—INTRODUCTORY

The Provincial Government by Commerce and Industry Department Resolution No. 8414-2880-A-VII, dated the 9th November 1944, announced the appointment of a Provincial Industries Committee consisting of—

Mr. P. S. Rau, C.I.E., I.C.S.—*Chairman.*

Mr. K. N. Nagarkatti, I.C.S.—*Vice-Chairman.*

#### *Members.*

- (1) Dr. S. A. Saletore, Director, Laxminarayan Institute of Technology, Nagpur.
- (2) Mr. S. H. Batlivala, Deputy Agent, Messrs. Tata and Sons, Limited, Nagpur.
- (3) Mr. P. Kodanda Rao of the Servants of India Society, Nagpur.
- (4) Mr. R. N. Jha, Honorary Secretary, Central Provinces and Berar Chamber of Commerce.
- (5) Khan Bahadur M. E. R. Malak, Managing Director, The Commercial Syndicate, Nagpur.
- (6) Mr. C. M. Harlow, C.I.E., Secretary to Government, C. P. and Berar, Development and Resettlement Department.
- (7) Mr. K. D. Guha, Director of Industries, C. P. and Berar.
- (8) Mr. P. T. Koman Nayar, Chief Inspector of Factories and Boilers, Central Provinces and Berar—to act also as Secretary to the Committee,

with the following terms of reference :—

- “(1) to make a rapid industrial survey of the province to indicate the number, types and capacities of the industries which already exist, and also, if possible, the availability of resources and markets for the expansion of the existing or the development of new industries;
- (2) to make recommendations regarding the promotion of new industries, or the extension of the existing ones, on the basis of the survey. Such recommendations should provide the following information :—

Type; capacity; location; markets; availability of raw materials; fuel or power; whether best promoted by Government or private agencies; Government participation if any; technical advice available or required; any assistance required from the Central Government;

- (3) to make a review of minor industries and cottage industries and to make recommendations on the lines mentioned against serial No. (2), and
- (4) to consider the question of co-operative industries, as well as the starting of cottage industries manufacturing components of major industries.

The Committee is empowered to appoint sub-committees and co-opt members for specific purposes.”

Mr. R. V. Deshmukh, Manager, Vidarbha Mills, Ellichpur, was subsequently added to the Committee.



2. At the preliminary meetings held on the 15th and 18th November 1944 the terms of reference were considered and a questionnaire drawn up. Copies of the questionnaire were issued by name to prominent industrialists, factory owners and certain other non-officials and also to Commissioners of Divisions, Heads of Departments and Deputy Commissioners of districts. It was translated into Hindi and Marathi and published for general information in various newspapers of the Province with a general appeal to all those interested to furnish the Committee with replies to the questionnaire. Although some 500 copies of the questionnaire were issued, the response was not as encouraging as we had hoped, only some 60 replies having been received. Some at least of this reluctance to answer our questions appears to be due to the suspicion entertained by industrialists of the intentions of Government and to the fear that, while little or nothing might eventually emerge from our work, the information collected by us would be at the disposal of their rivals. We tried our best to dispel these suspicions but not with any great measure of success.

A copy of the questionnaire is annexed to this report (Appendix A).

3. The procedure to be followed by the Committee was discussed and in view of the fact that only a rapid survey is to be made it was decided not to take formal evidence, but to have informal talks with select Government officers, representatives of industry, and individuals and associations. The following sub-committees were then formed :—

- I. Textiles.
- II. Minerals (metals and electro-chemical industries).
- III. Industrial chemicals and drugs.
- IV. Industries based on agricultural, forest, and animal products.
- V. Engineering industries.
- VI. Ceramics and cement.
- VII. Electricity and power.
- VIII. Minor and cottage industries.
- IX. Training of skilled personnel and research.

4. The gentlemen named below were co-opted as members for the specific purpose or purposes mentioned against each :—

*Name and purpose.*

- (1) Dr. P. S. Mene of the Laxminarayan Institute of Technology, Nagpur—Minerals.
- (2) Mr. L. H. Bartlett, O.B.E., Manager, Central Provinces Manganese Ore Co., Ltd., Nagpur—Minerals.
- (3) Mr. F. C. Bulsara, M.I.E., Chief Engineer, Model Mills, Nagpur—Engineering, Electricity and Power.
- (4) Mr. N. L. Belekar, President, Central Provinces and Berar Weavers' Co-operative Society, Ltd., Nagpur—Minor and Cottage Industries.
- (5) Mr. N. Bangaram, A.M.I.B.E., Manager, Rajaborari Estate and Radhasoami High School, Timarni, C. P.—Industries based on agricultural, forest and animal products and minor and cottage industries.
- (6) Mr. K. R. Minocha, Electrical Adviser to Government of C. P. and Berar—Engineering, Electricity and Power.

- (7) Mr. D. P. Ogale of the Nagpur Glass Works, Ltd., Nagpur—Ceramics and cement.
- (8) Mr. V. S. Phadke, Managing Director, The Central Potteries, Ltd., Nagpur—Ceramics and cement.
- (9) Dr. K. Krishnamurti, Principal, College of Science, Nagpur—Training of skilled personnel and research.
- (10) Dr. V. S. Jha, Officer on Special Duty, Department of Education, Central Provinces and Berar, Nagpur—Training of skilled personnel and research.
- (11) Dr. A. N. Kapoanna, Professor, College of Science, Nagpur—Industrial chemicals and drugs.
- (12) Mr. T. C. Joseph, Principal, Government Engineering School, Nagpur—Engineering industries.
- (13) Rao Bahadur D. D. Datar—Small scale industries.

The services of Mr. V. R. Khedkar of the Geological Survey of India were placed at the disposal of the Committee for a period of nine weeks in all.

5. The Committee or its sub-committees held informal consultations, among others, with—

- (1) The Central Provinces and Berar Chamber of Commerce.
- (2) Mr. R. H. Hill, M.A., Director of Agriculture, Central Provinces and Berar, Nagpur.
- (3) Mr. H. B. Shahi, M.R.C.V.S., D.T.V.M., Director of Veterinary Services, Central Provinces and Berar, Nagpur.
- (4) Mr. V. K. Maitland, M.C., I.F.S., Conservator of Forests, Eastern Circle, Central Provinces, Nagpur.
- (5) Mr. A. H. Stein, O.B.E., I.F.S., Forest Utilisation Officer, Central Provinces and Berar, Nagpur.
- (6) Dr. R. L. Tuli, Director of Public Health, Central Provinces and Berar, Nagpur.
- (7) Dr. Forrester, Principal of the Dhanbad School of Mines.
- (8) Dr. Crookshank, Director of Geological Survey of India.
- (9) Dr. Nanjee, Principal of the College of Technology, Madras.
- (10) Rao Bahadur Dr. D. V. Bal, Agricultural Chemist to Government, Central Provinces and Berar, Nagpur.
- (11) Rao Sahib P. D. Nair, Deputy Director of Agriculture, Economics and Marketing, Nagpur.
- (12) Mr. S. S. Pande, Economic Botanist to Government, Central Provinces and Berar, Nagpur.
- (13) Rao Sahib J. S. Gurjar, Officer on Special Duty, Verum Marketing, Nagpur.
- (14) Mr. H. N. Shrivastava, Director of Telegraphs, Central Circle, Nagpur.
- (15) Dr. P. C. Guha of the Indian Institute of Science, Bangalore.
- (16) Professor P. C. Mahalanobis, O.B.E., of the Statistical Laboratory, Presidency College, Calcutta.
- (17) Sir Henry Howard, Consulting Electrical Engineer, Madras.
- (18) Mr. K. P. Sagreiya, I.F.S., till lately Silviculturist, Central Provinces and Berar.

- (19) Mr. V. S. Dufton, Manager, Datla Collieries, Junnardeo.
- (20) Mr. H. J. B. Reynolds, Regional Coal Controller for Western Central Provinces, Parasia.
- (21) Mrs. D. E. Jackson, Managing Directress, Newton Chickli Collieries, Ltd., Parasia.
- (22) Mr. R. G. Chatterjee, Manager, Newton Chickli Collieries, Ltd., Parasia.
- (23) Mr. F. J. Cuerden, Regional Inspector, Technical Training Scheme, Nagpur.
- (24) Mr. M. A. Bambawale, Personal Assistant to the Chairman, National Service Labour Tribunal, Nagpur.
- (25) Mr. J. R. Hargreaves, Manager, Burn & Co. Ltd., Jubbulpore.
- (26) Mr. E. Johansen, Manager, The Associated Cement Co., Katni.
- (27) Mr. G. C. Natarajan, M.B.E., Retd. Superintendent, Government Printing, Nagpur.
- (28) Mr. A. C. Lodh, Manager, Associated Cement Co. Ltd., Katni.

6. We visited the Jubbulpore and Katni areas in order to assess the value of the special machinery and plant installed there in connection with the war effort as a basis for further industrialisation of the province and saw among others the Gun Carriage Factory, the Power House and the Pottery Works at Jubbulpore, the Ordnance Factory, Khamaria, the Ordnance Factory, Katni, the Cable Works at Mehgaon and the Cement and Asbestos Cement Factories at Kymore. We had interesting conversations with the managers of all these establishments.

7. A small sub-committee consisting of Messrs. Kodanda Rao and Koman Nayar visited the Pench Valley coalfield and interviewed various people, including the Regional Coal Controller, certain mine-owners, mine officials and others.

8. **The scheme of the report.**—After giving a brief history of Indian industries we explain the need for planning, emphasizing the special urgency of industrialising this province. Then follow chapters on individual groups of industries with our recommendations. Special chapters are devoted to such general subjects as State aid to industries, reorganization of the Provincial Industries Department, the collection and publication of statistical data bearing on industrial subjects, technical education and research, etc. A summary of our recommendations is given at the end of the report.

9. **What this report does not contain.**—Having regard to our terms of reference we do not propose to make more than a passing reference to the problems of Finance and Labour and other equally important aspects of industrialisation.

10. No one can be more conscious of the limitations of this report than ourselves. In the first place, we had to cover a vast ground; secondly, we were working against time; thirdly, we had not as much expert assistance as we should have liked; and lastly, some of our members had heavy ordinary duties to perform in addition to their work on the Committee and were therefore unable to devote as much time to the work of the Committee as they would have wished.

## CHAPTER II.—HISTORICAL.

11. Although India is, and for very many years to come will be, primarily an agricultural country, she has also been a great manufacturing country. "At a time", write the Indian Industrial Commission, "when the west of Europe, the birthplace of the modern industrial system, was inhabited by uncivilized tribes, India was famous for the wealth of her rulers and for the high artistic skill of her craftsmen. And, even at a much later period, when merchant adventurers from the west made their first appearance in India, the industrial development of this country was, at any rate, not inferior to that of the more advanced European nations."

"The skill of the Indians," says Professor Weber, "in the production of delicate woven fabrics, in the mixing of colours, the working of metals and precious stones, the preparation of essences and in all manner of technical arts, has from early times enjoyed a world-wide celebrity." There is evidence that Babylon traded with India in 3000 B.C. Mummies in Egyptian tombs, dating from 2000 B.C. have been found wrapped in Indian muslin of the finest quality. "There was a very large consumption of Indian manufactures in Rome. This is confirmed by the elder Pliny, who complained that vast sums of money were annually absorbed by commerce with India." "The muslins of Dacca were known to the Greeks under the name of *Gangetika* . . . Thus it may be safely concluded that in India the arts of cotton spinning and cotton weaving were in a high state of proficiency two thousand years ago . . . Cotton weaving was only introduced into England in the seventeenth century."\*

It is interesting to note that the famous muslins of Bengal were made of Hinganghat cotton.†

12. How at the end of the seventeenth century, great quantities of cheap and graceful Indian calicoes, muslins and chintzes were imported into England which found such favour that the woollen and silk manufacturers were seriously alarmed and how Acts of Parliament were passed in 1700 and 1721 absolutely prohibiting, with a very few specified exceptions, the employment of printed or dyed calicoes in England either in dress or in furniture and the use of any printed or dyed goods of which cotton formed any part, is familiar story.‡

13. The East India Company with its commercial instincts was at first inclined to foster the industries of India, but the later attitude of Government towards the promotion of industries has been greatly affected by *laissez faire* doctrines and fear of State competition with private enterprise. "This policy of non-intervention in the development of Indian industries," state the Indian Central Banking Enquiry Committee, "was generally pursued up to 1914. Sporadic efforts for giving active assistance to industries were, however, made by some of the local Governments, and these led in Madras to the development of the aluminium hollowware and chrome-tanning enterprises. Provincial departments of industries were also set up before 1914" in many of the provinces, though in most cases they existed only in a state of embryo. This policy of non-intervention of Government and their attitude towards the industrial development of the country combined with instances of anomalies in the fiscal, railway and stores purchase policies till recently followed in the country has exposed the

\**Imperial Gazetteer of India*, Volume III, page 195.

†See article on "Comras Cotton; The Problem of the Short Staple" in the *Empire Cotton Growing Review* for October 1925, by Dr. W. Youngman, page 313.

‡*Lecky's History of England in the Eighteenth Century*, Vol. VII pages 265-266.

Government to the charge of open hostility towards the interests of Indian industries prompted by the over-riding consideration of advancing British interests." When war broke out in 1914, there was almost universal regret that a more vigorous policy had not been followed in regard to Indian industries which might have enabled India to make a more substantial contribution to the common war effort. The progress of the war showed how little had been achieved in the domain of industries owing to the lack of a clear-cut policy and to the absence of an appropriate organisation of specialised experts. Much valuable time had been lost during which substantial advances might have been registered, and the outbreak of the war which should have proved an opportunity to reap the fruit of progress had served merely to reveal and accentuate startling deficiencies.\*

14. Lord Hardinge's Government were so impressed with these deficiencies and the need for a change of policy that in a despatch, dated the 26th November, 1915, they addressed the Secretary of State as follows :--

"It is becoming increasingly clear that a definite and self-conscious policy of improving the industrial capabilities of India will have to be pursued after the war, unless she is to become more and more a dumping ground for the manufactures of foreign nations who will be competing the more keenly for markets, the more it becomes apparent that the political future of the larger nations depends on their economic position. The attitude of the Indian public towards this important question is unanimous and cannot be left out of account. Manufacturers, politicians and the literate public have for long been pressing their demands for a definite and accepted policy of State aid to Indian industries and the demand is one which evokes the sympathy of all classes of Indians whose position or intelligence leads them to take any degree of interest in such matters."

They emphasised—

"The need for an industrial policy which will enable technical education in India to produce its best results, and which will lighten the pressure on purely literary courses and reduce the excessive demand for employment in the services and callings to which these courses lead up . . . . After the war India will consider herself entitled to demand the utmost help which her Government can afford to enable her to take her place, so far as circumstances permit, as a manufacturing country."

15. The Montagu-Chelmsford Report recorded a similar conclusion. The distinguished authors wrote,

"We are agreed therefore that there must be a definite change of view, and that the Government must admit and shoulder its responsibility for furthering the industrial development of the country."†

The familiar arguments against an active policy were noticed; the shyness of Indian capital, the alleged distaste of Indians for practical training, non-availability of skilled labour, dearth of technical institutions, etc., but they brushed them aside with the remark that though difficulties did exist, they must be surmounted.

16. The Industrial Commission which was appointed as a result of the representations made by the Government of India referred to above, drew pointed attention to the deficiencies of industrial

\*Report of the Indian Industrial Commission, paragraph 111.

†Report on Indian Constitutional Reforms, paragraph 338.

development of India. "The list of industries," they wrote, "which, though their products are essential alike in peace and war are lacking in this country, is lengthy and almost ominous. Until they are brought into existence on an adequate scale, Indian capitalists will, in times of peace, be deprived of a number of profitable enterprises. Whilst in the event of a war which renders sea transport impossible, India's all-important existing industries will be exposed to the risk of stoppage, her consumers to great hardship and her armed forces to the gravest possible danger."\* Between 1918 when these words were written and 1939, when the second Great War broke out, the country undoubtedly made some progress industrially, largely through the adoption of the recommendations of the Fiscal Commission in regard to discriminating protection, but still a very large lee-way had to be made up. Since then opinion all the world over has moved towards a greater realisation of the need for industrial development and the greater participation of the State in such development. With the entry of Japan into the present Great War and the severance of sea communications, India became an all-important base of military operations and, largely by reason of her industrial deficiencies, stood revealed to the world as a very vulnerable partner of the British Commonwealth of Nations, with the result that even those who were usually lukewarm in the cause of Indian industrial development became its advocates. In normal circumstances a report such as ours might have been expected to contain an elaborate criticism of *laissez faire*, but fortunately that is not necessary as that policy has since been completely abandoned, and in the expressive words of His Excellency Sir Henry Twynam, "the pragmatical approach to the problems with which we are confronted has completely driven *laissez faire* from the field of human thought."† "His Majesty's Government", declared the Secretary of State in a recent speech, "would like to see Indian industries developing to the fullest possible extent." Sir Ardeshir Dalal, Planning and Development Member of the Central Government, stated the other day that "the Government of India are determined to foster an intensive development of industries in this country both because such development is essential if the national wealth is to be increased and also because a country without highly developed industries has, under modern conditions, no political future." The Second Report on Reconstruction Planning issued by the Government of India a few months ago contains a remarkable statement of the problem of planning, its methods and principles, the necessity and urgency of preparing a well-considered plan and a summary of the development policy in regard to a large variety of important subjects. This has very greatly facilitated our task and we have made it the starting point of our survey and recommendations.

### CHAPTER III.—THE NEED FOR PLANNING

17. The Central Provinces was constituted as a separate province in the early sixties of the last century and Berar was added to it in the year 1903. The combined province occupies a strategic position in the centre of India, is nearly 100,000 square miles in extent of which about one-half is forest, reserved and private, and has a population, according to the census of 1941, of 16.8 millions of whom some three millions are aborigines. Being situated in the centre of India, the province

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\**Indian Industrial Commission Report*, paragraph 82.

†His Excellency's address inaugurating the 32nd Session of the Indian Science Congress at Nagpur.

is the meeting place of cultural and linguistic groups and is in consequence somewhat composite in character and many of its problems administrative, political and other, spring from this fact.

18. Planning of some kind for the future has become such an accepted part of current thought that we do not propose to take up much time by attempting a justification of it. The more backward a country, the greater the need and the urgency for planning. As has been observed by Sir Montague Barlow, Chairman of the Royal Commission on the Distribution of the Industrial Population in England, "if we do not lay our plans *before* the Armistice there will be no time to consider them *after it*."<sup>\*</sup> It is not generally realised how far England, the home of *laissez faire*, has travelled in the direction of State control of national activities; we need only refer to the subsidies given by the British Government to shipping by the British Shipping Act of 1935, to the financial assistance to the beet sugar industry before the war, to the encouragement of the dyestuffs industry, to the protection amounting to very nearly 100 per cent given to the Fertiliser Industry by the British General Tariff and the Key Industry Duty Act, and to the recent announcement by the Minister of Works that he was authorised by the Cabinet to proceed on a three-fold assumption, i.e., national planning, a central authority and a positive national policy. It may be added that the creation of an Industrial Planning Board with large powers of regulation of the location, size, etc., of new industries is under consideration. Practical problems of national planning have been considered by conferences convened by the Town and Country Planning Association at Oxford in 1941<sup>†</sup> and at Cambridge in 1942.<sup>‡</sup>

19. The object of any system of planning is to increase production, raise the standard of living of the mass of the people by increasing their purchasing power and to evolve a more balanced economy, and in the following paragraphs are set out briefly the existing conditions of the province which will indicate both the need and urgency of planning.

20. **Unbalanced economy.**—The most pressing problem of India is the extreme poverty of the people which is largely due to the unfortunate circumstance that agriculture forms almost the sole occupation of the mass of the population. The Famine Commission of 1880, while drawing attention to the unbalanced economy of India, said :

"A main cause of the disastrous consequences of Indian famines, and one of the greatest difficulties in the way of providing relief in an effectual shape, is ~~to~~ be found in the fact that the great mass of the people directly depend on agriculture, and that there is no other industry from which any considerable part of the population derives its support. The failure of the usual rains thus deprives the labouring class, as a whole, not only of the ordinary supplies of food obtainable at prices within their reach but also of the sole employment by which they can earn the means of procuring it. The complete remedy for this condition of things will be found only in the development of industries other than agriculture and independent of the fluctuations of the seasons."

21. **Agricultural backwardness.**—The pressure on agriculture is brought out by the following figures showing the numbers engaged

<sup>\*</sup>See *Replanning Britain* Edited by Towndrow, page 18.

<sup>†</sup>See *Replanning Britain*, Edited by F. E. Towndrow, Faber and Faber, 7/6 net.

<sup>‡</sup>See *Industry and Rural Life*, Edited by H. B. Newbold, Faber and Faber, 2/6 net.

in industries and agriculture together with the income derived from each source :—

Country	Total population in millions	Percentage depending on		Income per capita in Rs. from		Total income
		Industries	Agriculture	Industries	Agriculture	
U. K. ..	51	47	8	463	68	531
U. S. A. ..	130	32	22	830	219	1,050
India ..	389	10.2	67	12	48	60
C. P. ..	16.8	Not available.				

The Provincial Banking Enquiry Committee found that in this province fully 91 per cent of the population depended directly or indirectly upon agriculture or professions connected with rural life.\*

22. The statement that India lives in her villages is nowhere more true than in this province where no less than 87.5 per cent of the total population lives in villages. The urban population amounting to 2.1 millions lives in 119 towns with a population of 5,000 or more, of which Nagpur and Jubbulpore are the most important, with a combined population of .44 million. The place of agriculture in India's economy was realised early enough and a Department of Agriculture was formed as a result of the recommendations of the Famine Commission of 1880, but the results have not been outstanding, because from the beginning greater stress was laid on agricultural enquiry than on practical improvement of agriculture. Nothing was done till 1889 when Dr. Voelkar was brought out to advise on the improvement of Indian agriculture by scientific means. After careful study of the problems during an elaborate tour of the country, Dr. Voelkar prepared an exhaustive and illuminating report† suggesting in detail the lines on which agricultural improvement should be carried out. His careful analysis of the agricultural problems remains to this day a classic in Indian agricultural literature and if his principal recommendation had been carried out, Indian agriculture would have been quite different today. The most outstanding facts about the Provincial Agriculture Department are that it is grievously understaffed, that recruitment to the Imperial Agricultural Service ceased in the year 1920 and although a Class I Service was created in its place, no officer was recruited to it till 1930 and only three were appointed between 1930 and 1937; that its budget was reduced by Rs. 2½ lakhs in 1932 as a measure of economy during the depression period and that its expenditure on research is so small as to be almost negligible. It is not surprising therefore that our record in the agricultural field is not striking. An American expert told Sir M. Visvesvaraya's Economic Committee in 1925 that the crop yields in India were the lowest of any civilized country he knew of. The following figures bear out his statement :—

*Average yield of important crops (A).*  
(In lbs. per acre.)

Country	Wheat	Rice	Cotton	Groundnut
Germany ..	2,017	..	..	..
Italy ..	1,383	2,963	170	1,645
Japan ..	1,713	2,053	..	..
U. S. A. ..	846	1,413	268	803
China ..	989	2,433	204	1,668
Egypt ..	1,918	1,799	535	..
Canada ..	972	..	..	..
Australia ..	714	..	..	..
Spain ..	..	3,704	..	1,972
India ..	636	829	89	883

(A) Compiled from various sources.

\*Report of the Provincial Banking Enquiry Committee, paragraph 76 (based on the Census figures of 1921).

†Report on the Improvement of Indian Agriculture, by Dr. J. A. Voelkar.



*Average yield of the principal crops in the different provinces of India (A)*

Province	(In lbs. per acre.)				
	Wheat	Rice	Cotton	Groundnut in shell	Linseed
Bengal	..	921	..	..	607
U. P.	786	629	..	..	500
Punjab	738	..	182	..	..
Bombay	447	967	80	987	360
Madras	..	1,048	88	1,014	..
Sind	593	861	..	..	..
Orissa and Bihar	882	721	..	..	492
C. P. & Berar	444	655	101	606	215

(A) Compiled from various sources.

It is thus clear that while the Indian outturns are the lowest in the world, those of the Central Provinces are about the lowest in India.

**23. Food: Malnutrition: Unbalanced diet.**—Ritchie Calder in *The Democratic Order* says:

“A first principle of all social planning is that every one must be guaranteed the food that is necessary to maintain him in health.”

The experience of the war has brought into high relief the well-known fact that India does not produce enough food for her growing population. As the Second Report on Reconstruction Planning put it:

“It is clear that there are not, and have not been for many years past, sufficient cereals in the country to provide a meal of 1 lb. of cereals a day for every adult, and this bears out what is in fact, generally accepted, that a large proportion of the population of India is chronically undernourished. It must also be remembered that a ration of 1 lb. of cereals per adult per day is only considered adequate by nutrition authorities when it forms part of a total diet of 2½ lb. per adult per day consisting of supplementary protective foods, such as minor millets, pulses, milk, vegetables, fish, meat, but poverty denies these supplementary foods, except in negligible quantities, to a very great number of people in India. We have no reliable production statistics of these foods, but clearly the gap between national requirements and supplies available of these supplementary protective foods is still enormous. . . . But so long as the gap remains, our calculation of cereal requirements should provide for a larger ration than 1 lb. a day.”

“A well-balanced diet of the minimum requisite calorific value containing milk, meat, fish, vegetables, etc., in sufficient amounts cost from Rs. 5 to Rs. 6 per adult per month. It was shown by reference to income levels in India that the poorer classes in general could not possibly afford a well-balanced diet.”\*

Many millions of people in the country live in a chronic state of destitution and many more below what is regarded as the poverty line in western countries.

**24. Sanitation and Public Health: Inadequacy of Public Health organisation.**—Professor A. V. Hill, F.R.S., has given the following picture of the health conditions of India:—

“The mortality in India at all ages is 4 to 8 times that of Britain; the expectation of life at birth is 26 in India while it is 62 in Britain, only half the people born reach 22 years instead of

\*Government of India, Food Department, *Pamphlet on Food and Nutrition Policy in India*, by Dr. Aykroyd, page 2.

69 in that country. If you examine health statistics, 25 to 50 per cent of the entire population suffer from malaria and millions die of preventable diseases, such as, tuberculosis, cholera, plague and smallpox. A large part of the population is underfed, according to any reasonable standards, more than half; of these many millions are living on the verge of starvation. What are the results? Chronic malnutrition acts with disease in a vicious circle producing poverty and inefficiency."

This is a picture of the country as a whole. The conditions of the Central Provinces and Berar are worse still. Of all countries in the world, British India returns the highest death rate generally and the highest rate of infant mortality. And of all the provinces of British India, the Central Provinces and Berar has the unenviable distinction of returning the highest mortality, both general and infant. Malaria alone is responsible for more than half the deaths. Nearly half the children born in the province die before they attain the age of five years and yet the public health organisation of the province is of the most meagre description, the provincial expenditure on public health amounting only to 1.2 per cent of the total revenue of the province.

**25. Education : General illiteracy.**—Only some 11 per cent of the population satisfies even the very low standards of literacy expected by the Census. Thousands of boys and girls of school-going age have no schools to go to.

**26. Aborigines.**—The aborigines form an important section of our population and for them we do very little. "Though they constitute 3,000,000 of the population of the province, they have been neglected in the past and are educationally and politically unfitted to hold their own and protect their interests in the Provincial Legislature and local bodies or against the exploiter. Not a tenth of the special steps that have been taken for the Scheduled Castes or Harijans has been taken for the aboriginals".\*

**27. Inadequacy of financial resources : Low level of revenue and expenditure.**—One of the main causes of stagnation of the province is its poverty due largely to its resources being undeveloped which is reflected in its inelastic revenues. These in a normal pre-war year amounted to no more than Rs. 4.5 to 5 crores. It is doubtful whether civilized administration of a large province is possible within this sum. One remedy is to re-arrange provinces on some principle other than political exigency; another is to look upon India as one economic unit and distribute financial assistance from the centre on some basis which will take into account the backwardness of provinces and the need for development. Statements I and IV, appended, give a statistical picture of the province in the matter both of revenue and expenditure as compared with the other provinces of India. The figures disclose many interesting facts. Comparison and comment are, however, not easy as the conditions in various provinces differ. Statements regarding provincial revenue or expenditure per head of the population do not reveal the entire truth. Many facts have to be taken into consideration for appreciating their precise significance. For example, on the revenue side, allowance has to be made for the structure of the prevailing system of taxation and the levels of taxation already reached. On the expenditure side, we have to take into account such factors as density of the population and distribution of expenditure. Statistical generalisations have to be received with caution. Making due allowance, however, for all that has been said above, a glance at the tables shows that the position of

\*The Aboriginal Problem in the C. P. & Berar, by W. V. Grigson, page 10.

the province both on the revenue and expenditure side is unsatisfactory. The figures for this province in all cases are, if not the lowest, very near the lowest. The expenditure incurred on social services or what are popularly known as the nation-building departments, is not only inadequate at present but promises little hope for the future on the existing basis. The figures of expenditure *per capita* on education (Re. 0-5-8), medical aid (Re. 0-2-0), public health (Re. 0-0-8), industries (Re. 0-0-7), agriculture (Re. 0-2-9) make depressing reading. Large schemes of expenditure cannot be undertaken without material improvement on the revenue side. On the other hand, unless very much larger sums are spent on education, medical and public health, agricultural improvements and industrial research, the common man cannot contribute appreciably more to the wealth of the province.

**28. War effort as an argument for planning and industrialisation.**—Nearly 2.5 million young men of India, including some seventy-five thousand from this province have joined the Defence Forces of the Crown and have taken part in fighting on almost every front and have covered themselves with glory. On return, they will not be content to live from hand to mouth in the insanitary villages which they left. It is perhaps not possible to create a new heaven and a new earth, but the villages must at least be rendered fit for them to live in. This can only be done by relentless war against want. "But Want" as Sir William Beveridge says, "is one only of five giants on the road of reconstruction and in some ways the easiest to attack. The others are Disease, Ignorance, Squalor and Idleness."\* One of the chief means of overcoming these is by well considered planning of the different aspects of national life including industry.

**29. Example of Russia in Asia.**—Advocates of the *status quo* will no doubt tell us that a province so backward as the Central Provinces, with an illiterate population, with no great financial resources and with little or no industrial enterprise, cannot be industrialised overnight; but the backwardness of the Central Provinces, far from being an argument for its stagnation ought, in our opinion, to be a spur to greater activity. Russia has demonstrated to a sceptical world the immense possibilities of Central Asia than which few tracts are more backward. As an example of what can be done in Asia, and done quickly, one may consider industrial development in the Central Asian Republics of the U. S. S. R. "There are five of these Republics, some of the size of an Indian province but of which the entire population does not total more than a twenty-fifth part of the population of India. This region was mostly inhabited by a nomad type of Central Asian population whose habits and standards were comparable with those of the people of Baluchistan, Afghanistan or Tibet. The change accomplished by planned economy may be seen from the following brief notes:

**Tadjik Soviet Socialist Republic.**—Nearest point only ten miles from Indian frontier. Size that of Baluchistan or Sind. Population 1.25 millions or equal to that of one large Indian city. Extremely mountainous country on the flanks of the Pamirs, called the Roof of the World. The area is too hilly for railways but good air services exist even in mountainous areas. Nearly 1,000 miles of new trunk roads and a complete net-work of new motor roads. 57 power stations, some hydel stations combined with irrigation. Cotton grown in lower lands. Flourishing cotton industry run by electric power, petroleum wells, metals mined in what were previously inaccessible and uninhabited places.

\*Report on Social Insurance and Allied Services, 1942, by Sir William Beveridge, page 6.

**Turkmen Soviet Socialist Republic.**—Mostly rainless desert, about the size of Rajputana but housing only 1.25 million people. One busy double-track railway line right across the territory. Some roads, but air services hold first place for volume of traffic in the whole of the U. S. S. R.; uses 65,000 tons of chemical fertilisers yearly. Desert land being reclaimed. Largest cotton grower of Russia. Present crop 2/5ths that of India and will soon exceed half.

**Uzbek Soviet Socialist Republic.**—Rainless desert, steppe with malarial swamps near the Sea of Azov. About the size of either Bengal, Bihar or Bombay Province, population just over six millions. Has one of the largest hydro-electric plants in Russia; fertilisers and copper produced electrically. Produces 12,000 tons of soap. Is the coal base for the whole of the Russian Turkistan area.

Irrigation in these three provinces aggregates nearly 10,000 miles of canals which are mechanically cleaned and maintained. Extensive land reclamation by various methods.

**Kazak Soviet Socialist Republic.**—Area almost exactly the same as that of the whole of India, yet population only just over six millions. Bleak land, part desert, part steppe. Four main railway lines complete, crossing length and breadth of the area, two other lines nearly completed and another begun. Very fine network of air services. Three large irrigation projects commanding an area almost approximating Sukkar barrage. Coal production equal to one-fourth that of India. Oil industry, horse and cattle rearing, large meat packing industry.

**Kirghiz Soviet Socialist Republic.**—Area equal to the Punjab or the Central Provinces. Population only 1.5 millions. Mountainous, Himalayan type of country. Few railways but whole country opened up with roads. Several canals and reservoirs in the lower lands. Saw-mill industry in the abundant forests. Coal, cement, art silk, rubber, jute, sugar and chemical industries established.”\*

**30. Example of Brazil.**—But it will be objected that Russia is different from India. That is true enough. But take the case of Brazil, which is a country twice as large as India with possibly greater natural resources. Pre-war statistics show that it was then more backward than India in railways, roads, other communications, electrical development, internal and external trade and in other ways. Yet in the course of the last three or four years, Brazil has built up a steel industry and is producing her own electrical plant, railway material, locomotives and machinery. She has greatly expanded her sugar industry and is developing power alcohol in order to be independent of imported motor spirit at least in the hinter-land. She is also expanding in other directions, including agriculture and merchant shipping.

**31. Example of Australia and Canada.**—But it is not in Russia alone, or Brazil alone, that great progress has been made. The results achieved in those countries, particularly in Russia, are of course phenomenal, but something very striking has also been done in respectable capitalist countries like Australia and Canada. Australia used to be mainly an agricultural country and most of its exports consisted of foodstuffs of animal or vegetable origin, as also of wool, hides and skins, etc. Since the commencement of the war however it has developed industries, such as machine tool, chemical, motor car and locomotive industries remarkably. Mr. Harold Darling, Chairman of an Australian Steel Works—the Broken Hill Proprietors Co. Ltd., in a speech delivered at the Company’s annual general meeting

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\*Taken from *A First Approximation to the Problems involved in the Industrialisation of India*, by the Industrial Adviser to the Government of India.

on 29th August 1941 at Melbourne, said : "Industry in Australia was not equipped for the manufacture of guns and other war-like commodities. It had to learn and learn *quickly*. In the space of two years Australia from possessing virtually no capacity for the production of munitions has been turned to a veritable arsenal. . . I wish I could tell you of the many wonderful things that are being done—necessity having been the driving force." Sir Bertram Stevens, Australian Government's representative on the Eastern Group Supply Council, told us when he was in India in June 1941 of the steps taken by Australia to help herself. "We in Australia", he stated, "have been given full details of manufacturing processes and blue prints which we urgently require for war purposes from other countries. We had used every method to foster industries, not merely by tariff protection, but also by inviting British and American and other industrialists to come in and set up factories to replace former imports. The State and Commonwealth Governments helped to provide share capital and to a large extent private enterprise carried the whole scheme through."\*

As regards Canada, Mr. Harold Crabtree, the President of the Canadian Manufacturers' Association, quoting from an official statement of the latest war contracts in Canada, said in 1942, "By now the grand total of contracts placed and commitments made is over \$1,600,000,000 (approximately Rs. 532 crores). Total plant commitments exceed \$425,000,000 (Rs. 141 crores). Steel production was increased in Canada from 1,300,000 tons to over 2,000,000 tons a year, 190,000 army mechanical transport vehicles have been ordered in Canada and more than 100,000 of these have been delivered and are in service. From 1,500 men employed in Canadian shipyards, the number has gone up to 20,000 workers. Over 1,300 aircraft have been produced in Canada and about 40 planes a week are now being turned out"; very many more are being made now.

We should do the same in India, especially in the Central Provinces. Australia, which started producing steel only since the commencement of the war has now an output of more than 2 million tons a year while India which started this industry nearly 30 years ago is producing only 1.25 million tons.

In presenting the Annual Review from which we have quoted, Mr. Crabtree of the Canadian Manufacturers' Association further observed : "We have heard the argument many times in the past that Canada should be largely a producer of foods and raw materials and a trader of these commodities for the manufactured goods in other countries." A few months before his resignation Mr. R. G. Menzies, Premier of the Commonwealth of Australia, speaking in London before the Iron and Steel Institute, made a similar remark : "I used to meet such friends as I had in the iron and steel industry of Great Britain and they would say to me, almost sadly, 'What about you people in Australia? I am told that you grow very good wheat; I am told that your wool is excellent; I am told your butter is superb. But why do you, with your small population, set about making iron and steel? Why do you not leave it to us.'" He added that Australia was then really one of the great manufacturers of munitions in this war and the Chairman of the Institute could then say, "What are my resources of supply? One of them honourably placed is Australia." Mr. Menzies further added : "We not only see iron and steel in this country as the foundation of the defence of Great Britain, we not only see iron and steel in America as the foundation of an

ultimate and crushing victory, but we see iron and steel in Australia as the basis upon which the greatest effort of our lifetime is being put forth."\*

32. With such examples before us we have no reason to despair. All that is necessary is, in the striking words of Sir Ardeshir Dalal, faith, imagination and sympathy, and a determination to advance.

To sum up; we are an undeveloped province with very considerable resources both in men and materials; our agricultural standards are low, our educational standards are low, many of our people are underfed, diseased and badly housed; our towns are unhealthy, our villages are unhealthier still, hardly fit to live in. The need for planning in every department is truly desperate, but in none is it more so than in the matter of industrialisation. Thinking India is so impressed with the urgent need for progress that to achieve the object in view, it is prepared, within reason, to undergo any privation, face any taxation, and submit to any controls, with which, thanks to the war, we have already become familiar.

#### CHAPTER IV.—ELECTRICITY AND POWER

33. The provision of cheap motive power is a *sine qua non* of industrial progress and that appears to be the reason why one of the first steps taken in the preparation of the first Russian five-year plan was to set up a committee of two hundred scientists, engineers and technicians to draw up a scheme for the electrification of the whole country and the introduction of modern machinery as the basis of economic life.† That India is far behind other nations in the generation and consumption of electrical energy can be seen from the following statement showing the output of electricity per head per annum in various countries, taken from *A First Approximation to the Problems of Industrialising India*, by the Industrial Adviser to the Government of India :—

Kwh used			Kwh used		
U. S. A.	..	980	Germany	..	343
Belgium	..	976	Italy	..	341
U. K.	..	602	Spain	..	127
Australia	..	560	Poland	..	96
France	..	433	Brazil	..	68
Japan	..	368	India	..	5

34. In matters electrical, as in many other things, if India is the most backward country in the world, the Central Provinces is about the most backward province in India, as the following figures‡ for 1942-43 in thousand Kwh. shew :—

Provinces	Units generated	Units consumed for industrial purposes
Bombay	.. 1,114,377	669,315
Bengal	.. 681,011	487,884
Madras	.. 329,484	192,428
United Provinces	.. 304,329	170,824
Punjab	.. 106,008	45,976
Bihar	.. 68,690	62,407
Sind	.. 29,263	8,720
Central Provinces	.. 16,231	8,604
Orissa	.. 643	247

\*Quoted in Sir M. Visveswaraya's *Industrialising India*.

†*The Industrial Might of the U. S. S. R.*, by Bardin, Hirlekar's Soviet Russia, page 71.

‡*The Location of Industry in India* compiled by the office of the Economic Adviser to the Government of India, page 71.

"The total electrical energy generated in India in 1943", said the Electrical Commissioner with the Government of India, a few weeks ago,\* "was approximately 3,578 million Kw. hours, about the same as the weekly production of energy in the United States. In the United States about 180 times as much energy is used per head of population as in India, while in the United Kingdom the figure is about 100 times as much. These comparisons give an indication of the vast scope for the development of electricity in India. More than half the power generated in India is consumed in the four cities of Bombay, Calcutta, Cawnpore and Ahmedabad which contain less than  $1\frac{1}{2}$  per cent of the population of the whole country. Less than 7 per cent of the electricity used in India is consumed on domestic premises."

**35. Hydro-electric possibilities.**—The Central Provinces, being situated in the centre of India, is a kind of water-shed from which water quickly drains away and the hydro-electric possibilities of the Province are therefore somewhat limited, but we are more than compensated for this by our vast thermal resources. But such as they are, the hydro-electric possibilities have not been fully investigated. Till the year 1918, when the Indian Industrial Commission reported, hardly any attention appears to have been paid in this province to the question of providing hydro-electric power. In paragraph 100 of their report, the Commission stated that they "consider it necessary that Government should take in hand a systematic survey of the country to ascertain what hydro-electric possibilities exist, and that this should be started *at once* in view of the necessity of selecting, as early as possible, the best sites available for certain power industries. Delay to determine the resources of the country in this direction may involve much expenditure which might be avoided with the help of a previous survey". In accordance with this recommendation, the Government of India appointed Mr. G. T. Barlow, then Chief Engineer, Irrigation, United Provinces, associating with him in the enquiry Mr. J. W. Meares, Electrical Adviser to the Government of India, to make a hydrographical survey and make a preliminary report. In the place of Mr. Barlow who suddenly died of smallpox, Mr. Meares submitted the preliminary report in which he listed some 40 sites in the Central Provinces which seemed to promise hydro-electric possibilities. Subsequently as a result of reconnaissance a number of these sites was rejected as not worth further investigation and in paragraph 102, Volume III, of his Triennial Report containing a preliminary forecast of the water power resources of India, Mr. Meares gave details of 17 sites. Some of the more important of these sites (including the one at Totla Doh suggested by Tatas) are given below :—

Serial No.	River or site	Approximate location	Continuous estimated power in Kw.
1	Narbada river, Mandla district	About 50 miles south of Jubbulpore	11,000
2	Silgi Kasaha and Sankul Nadi, Jubbulpore.	About 43 miles south of Jubbulpore	7,000
3	Mahanadi, tributary of the Son	About 26 miles east of Jubbulpore ..	2,550
4	Totla Doh on the Pench ..	About 35 miles north of Nagpur..	8,000 (nearly)
5	Sillewani Ghat on the Kanhan	About 54 miles north of Nagpur ..	13,400
6	Penganga river near Dhanki in Yeotmal district.	About 60 miles south of Yeotmal ..	11,000
7	Indravati river, Chitrakot falls, Bastar State.	23 miles west of Jagdalpur ..	60,000
8	Tapti river ..	Near Burhanpur ..	15,000—20,000

\*Address to the Institute of Engineers on 1st February 1945.

Sites Nos. 1, 2 and 3 are close to Jubbulpore and if developed will supplement the existing steam power in the Katni-Jubbulpore area.

Sites Nos. 4 and 5 are close to Nagpur and will therefore supplement the power supply at Nagpur and the vicinity.

Sites Nos. 6 and 7 were considered to be the best of those seen by Mr. Meares.

Sites Nos. 6 and 8 will be very useful to Berar for developing its textile and other industries. Site No. 8, being close to the Bombay boundary, may be inter-connected with the proposed Bombay Grid extending supply up to Bhusawal and incidentally electrifying a considerable area in the province. Site No. 7 will be suitable for Chhattisgarh particularly for heavy industries in the Drug-Raipur area.

36. As a consequence of the Montagu-Chelmsford Reforms, the Government of India decided in October 1920 that "all outlay on water storage and water power will be a provincial charge and the necessary provision for hydro-electric surveys should therefore be made in the provincial estimates from and after 1921-22". Nothing further, however, was done by the Local Government in this direction.

37. The details of the preliminary investigations conducted in the province by Mr. Meares "are on record in the office of the Chief Engineer, Hydro-Electric Survey, and contain a mass of useful data regarding rainfall and run-off with maps and plans, discharge curves and so forth. Owing to the closing down of the work in the Central Provinces the data have mostly not been correlated: this would involve months of work and will, it may be hoped, be undertaken hereafter. At present, as is well known, the calculation of the flow from a catchment is little more than intelligent guess work. Regular gauging of the rivers, and the provision of automatic water stage recorders in the more important ones, is very necessary. The exceptional drought of 1920-21 offered a chance that may not recur for many years; in the interests of India, it was to be hoped that this will be so; *but the closing down of all investigation in this area at such a time is a disaster from the point of view of the survey of water power resources*".\* We understand that the Provincial Government is trying to obtain the above data from Delhi which, if available, would be extremely useful to the detailed survey we recommend. The Preliminary Report† notes that "There are few perennial rivers in the Central Provinces, except the Indravati, the Nerbudda and the Tapti. So water storage will generally be necessary. Sites for reservoirs exist plentifully but will not be cheap to develop." Few hydro-electric scheme in this province can therefore be developed without providing an artificial storage to ensure a minimum dependable flow throughout the year. Practically no information regarding the minimum stream flow or the run-off data are available in the province and practically no survey has been carried out for any of the sites mentioned earlier in this chapter since the closing down of the Government of India Hydro-Electric Survey Department.

38. The Sillewani Ghat project was originally suggested by Mr. F. Batchelor, I.C.S., Deputy Commissioner, Chhindwara. He proposed to lead the waters of the Pench at Barená Teli through a six-mile tunnel on to an open channel to which again would be diverted the tributaries of the river, the Kulbehra and Umra Nala. The open

\*Triennial Report with a Preliminary Forecast of the Water Power Resources of India, 1919 to 1921, Volume III, page 128.

†Preliminary Report on the Water Power Resources of India, 1919, page 42.



channel 20 miles long would lead to a forebay at Sillewani village on the Nagpur-Chhindwara road, 55 miles north of Nagpur, where a head of about 920 feet would be available by dropping the water to the Kanhan river below. The proposed long tunnelling in hard rock will, however, make the scheme very expensive.

39. In 1922 a preliminary study of the hydro-electric site on the Pench between Kundlai and Sarera (about 35 miles north of Nagpur) was carried out by the engineers of Messrs. Tatas in connection with the electrification of the Empress Mills. As they later decided in favour of installing steam power, the question of the development of the Pench river hydro-electric scheme was dropped. In 1933 the management of the Mills forwarded to the Provincial Government the report of their engineers on the project for further examination. The Provincial Government after obtaining the advice of its engineers decided not to pursue the matter further. In 1938 the question was re-opened and was referred to Sir William Stampe, who advised that the site at Totla Doh was unsuitable for the main reservoir but recommended that a detailed survey should be made for a reservoir site at Barenga Teli on the Pench river about 15 miles north of Chhindwara. But as war broke out shortly after, no further action was taken.

40. Such briefly is the history of the efforts made to develop hydro-electric power in the province.

41. The present position is that for want of previous detailed investigation no scheme can either be rejected or accepted for construction. The matter has now become one of extreme urgency both from the point of view of the industrialisation of the province and of raising the standard of living of its people. We therefore recommend that an *immediate* survey of the hydro-electric possibilities of the province should be undertaken. As it does not appear that the east of the province was included in their preliminary investigations by Messrs. Barlow and Meares, we suggest that special attention should be paid to the hydro-electric possibilities of Chhattisgarh. The Committee are gratified to learn that the Provincial Government has engaged that distinguished Electrical Engineer, Sir Henry Howard, to advise it on the hydro-electric problems of the province and we trust that it would be possible to have this preliminary survey also undertaken and completed under Sir Henry's guidance.

42. **Present position—Power—**(a) Electricity—general.—At present 26 licensed electrical undertakings are operated in this province. These have a total installed capacity of 20,940 Kw. while the peak-loads at various individual stations total up only 7,750 Kw. There are 18,700 consumers and the annual generation amounts to 29.54 million units. Of this energy nearly 65 per cent is generated in the two towns of Nagpur and Jabulpore. 24.2 million units are generated in steam stations using an average of 4.5 lb. of coal per unit. The coal consumption figures range from 2.8 per unit in the best, to 32 lb. per unit in the worst, station. 5.4 million units are generated by diesel oil engine power stations using an average of .8 lb. of fuel oil per unit.

(b) Electricity in industrial establishments.—Large industrial establishments like cement works and textile mills nearly all depend on their own steam plant for electrical power generation. These establishments have a total installed capacity of 24,730 Kw. and the total of their peak loads is about 15,000 Kw. Their annual generation of 57.7 million units consumes on an average 3.54 lb. of coal per unit, but the best of these stations uses only 2.55 lb.\* of coal per unit.

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\*The latest figure reported is even lower, being 2.2 lb. per unit.

(c) Power—other forms.—It is difficult to estimate the production of other forms of power in the province. The total installed capacity under this head is probably of the order of 75,000 B.H.P. Nearly 75 per cent of this capacity is believed to be in the Nagpur and Berar Divisions, in cotton mills, ginning and pressing factories, mines, and miscellaneous establishments like oil mills, workshops, flour mills and pumping stations. Gins and presses and rice mills are seasonal factories and these account for a large percentage of the total capacity. Generally power generation is by steam engine and these being mostly old and of antiquated types, are most wasteful of fuel. Thus although the province is rich in coal deposits, this advantage is completely lost so far as these smaller factories are concerned by the inefficiency of the power plant. Large-scale electrification will eliminate much of this waste, but large areas outside the reach of the grid proposed will still require attention. The coal shortage has focussed attention on the subject and a drive is afoot to prevent waste wherever it is found. This may with advantage be continued in some form after the present emergency has passed and made one of the duties of the Industrial Engineering Service proposed by us, so that power users will get proper advice on the type of plant most suitable for the load and on the relative merits of gas, steam and oil units, considering local conditions. Nor is this the only work for the organisation; the war has brought the charcoal gas-operated vehicle to the fore, and research is being done to make these vehicles efficient and popular for transport. Unfortunately, all such research in the country is based on the short-term view. If the producer-gas vehicle is to survive after the war, its most serious defect, *viz.*, inability to develop sufficient power, will have to be removed. An automobile engine working on gas develops only 40 per cent of its normal output of power. By increasing the compression ratio to the limit permissible even in existing engines, it is possible to take this figure up to 75 per cent. Alternatively, larger engines may be adopted, but very little research has been done in this direction. The Industrial Institute proposed by us will study this very important question.

43. Charcoal power.—Nearly half the area of the province is under forest, and in a large part of the country, charcoal is available in plenty. Before the war, the price in most areas was no more than Rs. 15 per ton. The small farmer can make his own charcoal out of waste wood and refuse fuel which is ideal for power generation in rural areas. The consumption of charcoal in producer-gas engines is only about three times that of oil in diesel engines, weight for weight, and power for power. The maintenance costs in stationary engines are, if anything, lower in the case of the gas engine. In spite of these advantages and the fact that freight and distribution costs of fuel oil are against it, the charcoal gas engine has made little headway in this province because of general apathy and ignorance. This state of affairs should be remedied and efforts made to popularise charcoal power units. Producers suitable for various fuels, including coal, can be made locally and this industry should be encouraged firstly by the supply of suitable designs and then by demonstration and propaganda on the use of gas engines.

44. Recommendations.—The Second Report says: "The policy of Government is to secure the development of electric power on a regional basis, to promote the maximum economic development and utilisation of such power, and to eradicate such factors in the present system as retard the healthy growth of such development. This policy may involve the development of electricity supply in India as a State or quasi-State enterprise".\* We are definitely of opinion

that the electricity supply projects which we recommend in the succeeding paragraphs should be State-owned and State-managed. Further, the problem of electrifying the province should be viewed as one and indivisible. It can no doubt be solved in stages by construction piecemeal or by regions but the whole should be conceived and planned as one. In this view, there should be the following five thermal schemes—first, the Central in the Nagpur area, second, the Northern in the Katni area, third, the Eastern in the Drug-Raipur area, fourth, the Pench Valley Scheme at or near Parasia and fifth, the Southern in the Chanda area. In view of the great urgency and necessity of developing electric power which is the basis of all industry, we recommend that steps should *at once* be initiated to construct thermal stations of the requisite capacity in the Nagpur, Katni, Drug-Raipur and Chhindwara areas. The preliminary investigations necessary for the Katni, Chhindwara and Drug-Raipur schemes should be undertaken at once and orders should be placed for the necessary plant and equipment for these four stations. When the hydro-electric survey we have recommended has been completed, the more promising schemes, such as the Barenga Teli on the Pench river and the Penganga near Dhanki in the Yeotmal district and others, which are found feasible should be taken in hand. These will supplement the electric power from the thermal stations. The whole when completed and linked up will form the Central Provinces Grid.

45. We consider that the thermal stations should be located as near the coal mines as possible and that the mines which supply fuel to the thermal stations should not only be owned but preferably also worked by the State. If mining rights in the mines concerned have already been leased to a private individual or company, we recommend that they should be bought up and the mines worked by Government.

46. In recommending electrical expansion on the lines suggested being undertaken by the State, the Committee are aware that for some years the revenue is not likely to meet all charges and expenditure. Such losses are inevitable and have to be borne if the final objective is to be achieved and the scheme become eventually profitable. Public opinion in the matter, as far as we have been able to gauge it, is overwhelmingly in favour both of State ownership and management and of speedy electrification. As far as industries are concerned, it is our intention that electricity should be made available to them at a rate not exceeding that at which they can themselves generate it. In the case of certain new industries, it may be desirable in the public interest to supply power even at lower rates.

47. **Immediate construction—(a) Nagpur.**—The station will be located in the Nagpur area and will supply power to Nagpur and the vicinity. It is proposed by Government to install 20,000 Kw. generating capacity immediately. Power will also be transmitted to Hinganghat over an extra high tension line and from Hinganghat branch lines will extend towards Chanda, Wardha, Pulgaon and Yeotmal immediately and beyond, if required. The necessary facilities for large-scale power generation being available near Nagpur, the plant capacity can be increased if demand for additional power arises. The other regional schemes visualised will be similar in character.

(b) **The Northern Scheme:** In the Katni area.—The total existing peakload in the Katni-Jubbulpore area is nearly 9,000 Kw. The most efficient generating plants in the area include two 4,000 Kw. generators at the Jubbulpore Power Station of which one is already

working and the other is being erected. There is also one 3,750 Kw. generator at Kymore. The plant in the other power houses is mostly old. As surplus generating capacity is available at Jubbulpore, the question of inter-connection of the various power houses in the area should be taken up immediately to effect an overall economy in generation and for developing the region.

In *The Mineral Resources of the Central Provinces and Berar*, we read that coal "has been found in the upper Gondwanas mostly in the Jubbulpore division, as for instance, at Lamta Ghat, Sihora tahsil of Jubbulpore, Moran river area near Lokartarai, etc. The upper Gondwana coal has however never been considered worthy of exploitation except for local purposes". If, as we understand, this coal is not unsuitable for thermal generation, then every effort should be made to utilise it for the purpose. Prospecting operations should be set on foot immediately and the results examined.

(c) Chhindwara colliery area.—There is already a well-developed load about 2,000 to 2,500 Kw. in the shape of existing collieries. The Government of India Scheme for the immediate increase of the output of coal in the area includes the installation of a power station which is likely to come into operation within a year or so. The Provincial Government should take over the management of this station from the Central Government and eventually acquire it. Doubts have been entertained about the availability of water in the coalfield in sufficient quantities to allow future expansion. The Tawa Valley has therefore been suggested as an alternative site. If the nearby Patakheda colliery can be worked as a State concern, it would be an additional advantage. There is also a proposal for a paper mill in this area which will require energy of about 2,000 Kw. to start with. The matter should be carefully examined before the site of the power station is finally decided upon.

(d) Eastern Scheme: Rajnandgaon-Drug-Raipur area.—This scheme should be taken in hand without delay. The Bengal-Nagpur Cotton Mills at Rajnandgaon are contemplating the installation of a modern power plant, but if a thermal power station is installed in the Drug-Raipur area and power supplied to them, they may prefer to drop the idea of generating their own power. Considering the existing and immediate loads in the Raipur-Drug area it is estimated that two 5,000 Kw. steam turbines would suffice for the present.

As we have said before, all these schemes will eventually be inter-connected to form a complete grid and will possibly be linked up with the Bombay, United Provinces and the Madras-Orissa systems to form one grand electrical system.

43. These recommendations, far-reaching though they may appear to be, when compared with our present condition, do not really go far enough if the intention is—as we believe it is—to take electricity into the rural areas of the province within a measureable space of time. They no doubt seek to make an advance on our present very low *per capita* consumption in the province of 5.5 Kw. inclusive of industrial loads, but still will not take us anywhere near Mysore's present figure of 49.5 Kw. Important areas within the reach of the grid proposed by us will no doubt be electrified, but even then large tracts of the province will remain unelectrified. Thus, for instance, out of a total of 73 towns each with a population of 8,000 and above, as many as 43 will not be reached. Such areas should have their own thermal stations to develop a load with a view to their eventual connection with the Provincial Grid system. These developments should also be planned and executed in an ordered manner.

## CHAPTER V.—MINERALS AND MINERAL PRODUCTS

49. A detailed account of the mineral resources of the province is given in the Central Provinces Government's publication, *The Mineral Resources of the Central Provinces and Berar, 1942*, on which we have freely drawn.

50. The Central Provinces is rich in minerals but the information available, though extremely valuable, is neither so complete nor so detailed as one would wish it to be, chiefly because the approach of the Geological Survey of India to geological problems has been till very recently purely scientific and had little reference to the industrial possibilities of the minerals under investigation or their economic utilisation. As has been stated by Sir Cyril Fox, till lately Director of the Geological Survey of India, at a Conference held in July 1942, "the work of geologists in India was mainly to promote the export of raw materials rather than to encourage industrial development in this country". This drawback has however recently been rectified to some slight extent by enlarging the staff and by the creation of a utilisation branch of the Service but a great deal more remains to be done. "In 1937", writes Sir Cyril Fox, "the organisation which was responsible for all the prospecting operations, mineral production and preparation in Soviet Russia was the envy of all those geologists who then visited the U. S. S. R."\*. The number of geologists employed in Russia is variously estimated at 2,500 or more. On the other hand the strength of the Geological Survey of India was only 64 including the officers of the Utilisation Branch according to the Combined Civil List for India and Burma, January 1944. Although India may not be able to engage such vast numbers as Russia, something more could and should be done than has been attempted. What is *immediately* required is detailed geological mapping of the whole province on 1" = 1 mile scale, with large-scale plans of mineral bodies and detailed accounts of the quality and quantity of the mineral deposits. Mapping should be completed in say ten years, if not earlier, and this would require a large staff. Assuming that one geologist can cover 250 square miles in a year (working season six months), we require some 40 geologists to cover the 100,000 square miles of the province in ten years. We consider that this staff should be recruited without delay, if necessary from abroad on short-term contracts. There is a great dearth of geologists, as of other scientists, in India and, of course, also in the Central Provinces. We were told that the Nagpur University is considering the desirability of teaching geology. We consider that this is long overdue, and that geology along with mining and metallurgy should be introduced immediately as principal subjects for the B. Sc. and M. Sc. degrees of the University with a suitable period of practical training as an essential part of the courses. We are aware that the further enlargement of the Geological Survey of India is under consideration and we hope that the department as reorganised would be in a position to assist provinces more than at present; in particular, by placing some officers at the disposal of Provincial Governments to help them generally with their investigations and advice on any specific local problems. It is understood that the Provincial Government has already taken steps to obtain the services of a Mining Adviser.

51. *The Second Report on Reconstruction Planning* says: "As minerals are a *wasting* asset, the question of ensuring their maximum utility and minimum waste is most important. Regulation of mines \* \* \* and of mineral development has, however, so far remained a

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\* *Bulletin "O"*, by Sir Cyril Fox, 1942 Edition, page 40.

predominantly Provincial subject. As a planned and uniform policy will be more and more necessary in future, it is proposed to make, in so far as the constitution allows, a beginning in this direction by bringing under Central control all minerals of strategic or key industrial importance. The steps necessary to give effect to this policy are under consideration."\* We agree, and would only add that the development not only of the more important minerals but also of the industries connected therewith should be taken under Central control and a Central Act passed, bringing under Central direction (1) Coal; (2) Iron and Steel; (3) Manganese; and (4) Bauxite and Aluminium. As the execution of this policy will rest largely with Provincial Governments, provision will no doubt be made for full consultation with provinces at every stage.

52. The chief mineral resources of the province consist of coal, iron, manganese, bauxite, limestone, steatite and ceramic and other clays.

53. Coal.—Coal is the most extensively worked mineral in the province. The Central Provinces coalfields fall into three groups, viz., the Chhattisgarh-Mahanadi area, the Satpura region, and the Wardha Valley. In quality, the Central Provinces coal is generally inferior to the Bihar coal and falls in the second and third grade qualities of the Coal Grading Board classification, though a limited quantity of first grade coal is found in some fields, particularly in the Mahanadi area. The average calorific value of our coals ranges from 5,500 to 6,500 calories per gram and the ash content varies between 15 and 25 per cent. As regards the quantities present, only very rough estimates are available. A good deal of detailed work, both surface survey and underground exploration by numerous boreholes, wherever the prospects are encouraging, will have to be done in order to bring our knowledge to the same level of accuracy as is available for the important fields of Bihar. The reserves up to a depth of a thousand feet have been roughly estimated by Sir Cyril Fox to amount to—

Chhattisgarh-Mahanadi—1,000 million tons.

Satpura region—150 million tons.

Wardha Valley—4,000 million tons.

Total—5,150 million tons.

A part of these reserves lies in Indian States especially Raigarh, Korea and Sirguja.

54. The results of analysis of typical Central Provinces coals are shewn in Statement No. V.

Statement No. VI contains statistics of recent coal raisings. Considerations of security prevent us from giving the figures of production for the last few years. But it may be generally stated that in spite of every effort to step up production the results are not encouraging, the principal reason being shortage of labour and lack of essential stores and equipment. Nearly half the coal output of the province is produced by the group of collieries under Shaw Wallace & Company in the Chhindwara district. These collieries and three others in the Wardha Valley are electrified; the remaining are not, although three of them are of fair size. The smaller collieries, about 10 in number, together produce about an eighth of the total coal output and are somewhat too small to work on economic lines.

55. Present methods of raising and utilising coal need considerable improvement. Electrification is the first need. The somewhat more general use of specialised machinery is another. Fuel resources

should be conserved by the use of inferior varieties of coal for power generation, particularly in view of the large demands that are likely to be made as a result of the progressive industrialisation of the country. The coking coals of Bihar should as far as possible be reserved for metallurgical purposes, and not used also for steam raising as at present. This matter, however, is already under consideration by the Government of India. The Second Report says, "The whole question of the rationalisation of the coal industry will be taken up especially as regards production, distribution and use of the various grades of coal with the object of preserving as far as possible the limited supplies of coking coal."\* This is particularly necessary in the Central Provinces where the quantity of coking coal available is limited. We know that there is a certain amount of coking coal in the Mahanadi area and we have been informed that in the Pench Valley field itself some 40 feet below the first seam, about 4'—6" seams of partially coking coals have been found. The Report continues, "Researches in the better utilisation of coal, including the development of economical methods of producing soft coke and the recovery of the many by-products in its manufacture have been already initiated in collaboration with the Board of Scientific and Industrial Research. Further encouragement of research in all these directions is foreshadowed in the schemes now under the consideration of the Central Government."\* The Central Provinces and Berar is vitally interested in all research into the better utilisation of coal. Research is also necessary for devising methods whereby its non-coking coals can be converted into coking coals. Exposure of slack of non-coking coals to gases from coal distillation or coke-oven plants merely removes moisture from the slack and renders it immune to the danger of spontaneous combustion, but prolonged treatment, it is claimed, will convert non-coking coal into one capable of yielding hard coke.† Intensive investigation is clearly indicated.

**56. Iron and Steel.**—Iron ores are widely distributed throughout the province, which is now perhaps the chief home in India of iron smelting in small indigenous blast furnaces. These furnaces are however now on the decline as will appear from the fact that, while in 1909 Bilaspur had 103, Drug 56 and Raipur 230 of them, in 1937 they had only 59, 6 and 3, respectively. The ore occurs chiefly in the Narsinghpur Sub-Division of the Hoshangabad district and in the Chanda, Drug and Jubbulpore districts.

No quantitative estimate of the Narsinghpur or Jubbulpore ore has yet been made.

In the Chanda district, the best known deposits are found in Lohara near Chanda, where the iron ore forms a hill 650 yards long, 200 yards wide and 120 feet high and has been traced for a further distance of 2½ miles, with an estimated reserve of roughly two million tons. These ores are of very high quality as can be seen from Statement No. VII annexed.

**57.** In the Drug district the deposits occur chiefly in the Dondi-Lohara Zamindari in the south in the shape of conspicuous hillocks. The most striking of these is the ridge which includes the Dalli and Rajahara hills, extending for some 20 miles in a zigzag, almost continuous line, and rising to heights of sometimes 400 feet above the general level of the flat country around. Sixty-four samples have been subjected to careful analysis and the average results obtained for the surface samples were iron 66.35, phosphorus 0.058, sulphur 0.108,

\* *Second Report on Reconstruction Planning*, page 34.

† *Bulletin "O"*, by Sir Cyril Fox, 1940 Edition, pages 26-27.

silica 1.44 and manganese 0.151 per cent, while for the cores (deeper layers) the averages were iron 68.56, phosphorus 0.064, sulphur 0.071, silica 0.71, and manganese 0.175 per cent. Prospecting operations have proved the existence of 2.5 million tons of ore carrying about 67.5 per cent of iron and a phosphorus content slightly below the Bessemer limit. The quantity estimated is that which may be regarded as ore in sight while almost certainly much larger quantities may be obtained by continuation of the ore-bodies beyond their proved depth.\*

The total reserves in the Dondi-Lohara Zamindari have been estimated to be of the order of 114 million tons.

58. India has for long been famous as a manufacturer of iron and steel. "Casting iron", says Professor Wilson, "is an art that is practised in this manufacturing country (England) only within a few years. The Hindus have the art of smelting iron, of welding it, and of making steel, and have had these arts from time immemorial". The late Mr. Ranade in his *Essays on Indian Economics* wrote :—

"The iron industry not only supplied all local wants, but it also enabled India to export its finished products to foreign countries. The quality of the material turned out had also a world-wide fame. The famous Iron Pillar near Delhi, which is at least fifteen hundred years old, indicates an amount of skill in the manufacture of wrought iron, which has been the marvel of all who have endeavoured to account for it. Mr. Ball (late of the Geological Survey of India) admits that it is not many years since the production of such a pillar would have been an impossibility in the largest factories in the world, and, even now, there are comparatively very few factories where such a mass of metal could be turned out. Cannons were manufactured in Assam of the largest calibre, Indian wootz or steel furnished the materials out of which Damascus blades with a world-wide reputation were made; and it paid Persian merchants in those old times to travel all the way to India to obtain these materials and export them to Asia. The Indian steel found once considerable demand for cutlery even in England. This manufacture of steel and wrought iron had reached a high perfection at least two thousand years ago."

There is a record that steel was exported to Glasgow from South India in the middle of the last century and that it was of a better quality than that made in the United Kingdom.†

59. At present the steel industry of India is practically in the hands of two or three large manufacturers; in the Central Provinces itself no iron or steel is made by modern methods. The Indian Tariff Board in their report on this industry in 1933-34 referred to the complaints they had received about the 'monopolistic' attitude of the Tata Company. They stated that in future it would be a development greatly to be desired that steel production should not remain the practical monopoly of a single enterprise.‡ It is therefore in the national interest that encouragement should be given to the promotion of steel industry wherever local conditions permit.

It is well known that the late Jamshedji Tata seriously considered the possibility of manufacturing steel in Chanda, but was obliged to give up the idea on account of the non-availability of coking coals in the province.

\*The Mineral Resources of the Central Provinces, page 21.

†Reconstruction in Post-War India by Sir M. Visvesvaraya, page 14.

‡Report of the India Tariff Board on the Iron and Steel Industry (1934), page 13.



60. It may be of interest to mention that the Krupp-Renn process, recently tried out in Germany, makes it possible to manufacture steel direct from the ore without having to convert it first into pig-iron. The process is also independent of coking coal, any kind of coal being suitable. Here crushed ore and carbon together with slagging material are fed into one end of a rotary kiln and loops of steel collected at the other. The loops of metal are crushed to shed the slag and the resultant product is good steel ready for being melted electrically or by the open hearth process. The process should be investigated further and if samples of Central Provinces ores are found fit for this treatment and the scheme is justified economically, plant capable of dealing with 250 to 300 tons of ore per day can be installed near the mines in the Chanda or Drug district. It is estimated that 0.4 ton of carbon will be used for every ton of ore treated and that the carbon may be in the form of soft coke or charcoal. This may justify the installation of a coal carbonisation plant dealing with 250 to 300 tons of coal a day. In this matter of carbonisation of local coals also, samples will have to be tried out both for low and high temperature carbonisation under working conditions.

61. The discovery of coking coals in the Mahanadi area is of very considerable interest to the future of the iron and steel industry in this province, for the principal reason why the industry has not yet been established is the absence of coking coal in commercial quantities. The foundations of a steel industry can be laid either in the Chanda or Drug district so soon as coking coals could be made available in the requisite quantities, for the other raw materials required, *viz.*, superior iron ore, limestone, refractory materials, etc., are present in abundance. Electric power could be obtained either from the local thermal stations, we visualise, or in the Drug area, from the Chitrakut Hydro-Electric Project in the Bastar State, which we hope will be established as soon as possible. As has been stated in the chapter on Power, preliminary investigation revealed that there is every prospect of obtaining cheap power from this project and we recommend that the Provincial Government should arrange with the Government of India for the completion of this regional scheme without delay and claim their share of the power when it becomes available.

As there will be considerable industrial expansion, the steel produced will find a ready market.

62. In view of the extreme importance of the iron and steel industry in the industrial economy of India, we are of opinion that every effort should be made by Government, both by pursuing the suggestions made above and otherwise, to establish the industry in the province. Private enterprise should receive every kind of help and encouragement from Government in the establishment of the industry including, if necessary, the purchase of shares up to 51 per cent of the total capital and the nomination of Government directors.

63. **Manganese.**—The Central Provinces manganese deposits are among the finest in the world, but the reserves of higher grade ores (above 48 per cent manganese) were estimated in 1943 to be of the order of only 10 to 20 million tons. The chief manganese ores are in the Nagpur, Bhandara and Balaghat districts. No new deposits have come to light during recent years.\* Practically all the known areas are under mining leases and nearly 90 per cent of the known manganese deposits are leased to one company, *viz.*, the Central Provinces

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\* *Review of the Mineral Resources, etc.* by the Mining, Geological and Metallurgical Institute of India, December 1943.

Manganese Ore Company, which is a British company with sterling capital. The industry consists in merely digging the ore and exporting practically all of it to foreign countries in the raw condition. The proportion of manganese ore used in India is negligible, being in the neighbourhood of 5 per cent. The great bulk of the output is now exported to the United States of America and to England mostly for war purposes.

64. The average annual output during the 29 years 1909 to 1937 amounted to just under half a million tons. Raisings in 1938 and 1939 totalled .65 and .55 million tons, respectively, or about 83 per cent of the all-India production in those two years. Since the outbreak of the present war, production has gone down somewhat, but the figures cannot be revealed for security reasons.

65. At the pre-war rate of extraction the known reserves will not last more than some 30 years. No further expansion of manganese mining is therefore desirable. On the contrary, there would seem to be every justification for slowing down the present rate of exploitation considerably after the war in view of our rapidly dwindling resources. Manganese is a vital ingredient in the manufacture of mild steels and alloy-steels and our reserves will have to be carefully husbanded. It is no doubt in recognition of this fact that Government has recently placed a ban on new leases. But this is not sufficient because, as has been stated above, most of the known areas have already been leased out. It is therefore for serious consideration whether the public interest does not require that the virtual monopoly that has been created should be terminated. We consider that the proper solution of the problem would be to acquire for the State the interest of the Central Provinces Manganese Ore Company and of the smaller lessees by payment of proper compensation. This aspect of the case has not escaped the notice of the Government of India, who write in the Second Report, that "industries for which some measure of State control is necessary include public utilities when they are not wholly owned or managed by the State, basic industries and industries utilising scarce natural resources which are likely, in the absence of control, to transform themselves into monopolies."\* In our opinion all that is necessary in the case of manganese is for the State to take over the manganese mines after the war by extinguishing private lease-hold rights in them on payment of fair compensation, with a view to conserving this rare mineral and regulating and planning the development of the manganese industry to the maximum national advantage. Whether the mines should be worked by the Government itself or by private agency is a matter which we leave to Government to decide in the light of all the circumstances. As Sir Cyril Fox says, "the available evidence shews that strict supervision is desirable in the extraction of most minerals in this country and that definite encouragement would lead to the establishment of industries such as the manufacture of ferro-alloys, aluminium and various other substances derived from mineral raw material in India."† In so far as export is concerned, the desirability of utilising it in order to secure reciprocal advantages from other countries may be explored. This is another reason why key minerals should be under Central direction and control.

66. While on this subject, we may add that, as regards other minerals, the rates of royalty at present levied appear to be susceptible of substantial increase and we suggest that the matter should be

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\*Second Report on Reconstruction Planning, page 9.

† Bulletin "O", by Sir Cyril Fox, 1942 Edition, page 47.

examined and the rates increased, particularly in the case of those minerals which, in the existing condition of Indian industry, cannot be extensively utilised in the country.

67. In spite of our large deposits of manganese it is unfortunate that there appears to be no present prospect of the province being able to manufacture ferro-manganese on a commercial scale. This is not only because cheap power is not available but also because the steel companies make their own ferro-manganese at a much lower cost than we could make it. We feel, however, that when cheap electricity does become available, either as a result of the construction of the Rewa Hydro-Electric Project or the establishment of the Northern thermal station in the Jubbulpore-Katni area, the economics of the manufacture of ferro-manganese should be carefully gone into.

68. **Bauxite.**—Extensive deposits of bauxite are to be found in the Katni tahsil of the Jubbulpore district, the Baihar plateau of the Balaghat district, in the Seoni Sub-Division of the Chhindwara district and in the Mandla district. The ore is good, containing on an average 60 per cent alumina, 8 per cent titanium oxide, and 3 to 4 per cent ferric oxide. Further details will be found in Statement No. X annexed.

69. In 1937, the raisings amounted to under 10,000 tons, but have since gone up substantially owing to war demands though the figures are not available. Very little ore is exported outside India. Considerable quantities are consumed by the aluminium factory at Asansol and the alum works in the United Provinces and Bengal. All the ore mined in the province, except for small quantities used in the manufacture of fire-bricks in Jubbulpore, is exported in the raw state.

70. Bauxite is the chief raw material used in the production of aluminium metal by electrolysis. It is used in decolourising petroleum and removing sulphur compounds therefrom. It also finds application in the manufacture of cement and refractories, such as fire-bricks and furnace-linings, and abrasives. With the contemplated development of transport facilities and of the water power resources of the province for the production of cheap electricity, it should be possible to encourage the establishment of an aluminium industry.

71. Aluminium being an essential metal in the future economy of India, next in importance only to iron and steel, its manufacture should be located where it can be most economically produced. The industry cannot certainly be put on a sound footing if, as now, the bauxite has to be taken hundreds of miles by rail from Katni to Asansol\* where it is refined into alumina and, either reduced to aluminium there with thermal electricity, or sent over a thousand miles by rail to a reduction works at Alwaye in Travancore employing hydro-electric power. We are not unaware of the fact that in Canada and the U. S. A. alumina is brought thousands of miles to the reduction works but this is justified by the extremely cheap power available there, which scarcely holds in the case of Alwaye. The obvious solution is to develop hydro-electric power near where both coal and bauxite are available in close proximity, if this is possible as in Katni. Such hydro-electric schemes should receive first priority and executed even at a slightly higher initial cost thus harnessing natural forces to the development of industry and conserving natural fuel resources.

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\*4,720 tons of Katni bauxite was exported to Asansol in 1944.

**72. The market for aluminium products should be developed.** The large quantities of salvage metal which will soon become available, instead of depressing the market for new production, should be utilised to develop it. The idea is that such salvage metal should be applied to new purposes only, such as the production of alloys for structural sections, hardware, etc. With some planning the Railway Post-war Coach-building Programme, for example, will be able to consume a large quantity of the alloys and, once the use of the metal is established, will make fresh demands on the producing industry.

**73. Industries based on bauxite.**—Before we proceed to consider in detail the industries based on bauxite, we should like to recommend that higher grade bauxite ores should be reserved for the manufacture of aluminium, inferior ores being used in other industries. In order to achieve this, it may be necessary to introduce a system of grading. The new industries visualised are :—

(a) **Alumina.**—An alumina plant at Katni capable of manufacturing 20 tons per day of calcined alumina and 10 tons of hydrate for use in alum and chemical works. The calcined alumina manufactured will have to be planned with the production of the aluminium metal in a reduction works situated preferably at Katni. The raw products required are two tons of bauxite, 3 tons of coal and  $1\frac{1}{2}$  cwt. of caustic soda for every ton of calcined alumina.\* With the exception of caustic soda all these raw materials are available nearby. The power required for grinding and other processes will be generated by a turbine through which steam requirements for the process are taken. About 5 cwt. of imported furnace oil may be necessary for firing the rotary calciner.

(b) **Alum.**—Ten tons of hydrate from the above process can be used in the manufacture of chemicals, mainly aluminium sulphate. The present annual demand for aluminous sulphate is estimated at 13,000 tons, of which Indian production—now largely based on Katni bauxite—is estimated to be 7,000 tons. Aluminium sulphate is largely used by paper mills, which consume about 8,000 tons annually, and also for water purification. As there is likely to be great expansion both of the water purification and the paper mill industry the product will find no difficulty for markets. The raw materials required for aluminium sulphate manufacture are the hydrate already mentioned and sulphuric acid. Sulphuric acid can be made after the war from imported sulphur and the establishment of the sulphuric acid industry will help other industries. Coal can be obtained from the nearby collieries in Rewa State. Power requirements will be small. The Katni ore contains such a large percentage of titanium that the filter-mud rejected from the process will, on a water-free basis, contain up to 40 per cent titania. This offers scope for a titania recovery works. Titania has now become a very important pigment for making superior white paints.

(c) **Aluminium.**—A reduction plant for producing 10 tons of metal a day, to begin with, is proposed for Katni together with rolling mills and a small hollow-ware factory. The metal has an immense future in this country, though the market for it has not yet developed a great deal. India imported only 3,345 tons of aluminium in wrought and ingots in 1937-38† and since then 2 factories have been established in India, one at Asansol and the other at Alwaye in

\*Based on *Chemical Engineering Flow-Sheet No. 6*, by McGraw-Hill, 1940, and *Paper on The Aluminium Industry in Scotland*, by George Boex, Institution of Mechanical Engineers, 1933.

†Accounts relating to the Sea-borne Trade and Navigation of British India for March 1939, page 78.

Travancore, capable of an output of 5,500 tons\* and it would seem that we have secured a production-capacity sufficient for our requirements. Actually, however, even the fringe of the potential market for aluminium has not been touched and if it can be made cheap enough by eliminating uneconomic methods and waste in taking raw materials over long distances by rail to the reduction works, the future seems assured. In December 1937, the British Aluminium Company made proposals for erecting a factory at Katni if current could be made available at or below 2 pies per unit. Although their idea was to install a plant initially capable of an output of 3,600 tons a year, they visualised a rise in demand in the course of a few years which would call for an increase in output up to 10,000 tons a year. This is noteworthy coming as it does from a firm having considerable experience of the aluminium industry. Almost the first result of any increase in the standards of living of the masses will be an increased demand for aluminium utensils to replace the earthenware ones now used by millions of the poor. Copper and copper alloys are expensive and, as India is short of copper and is favourably placed for the manufacture of aluminium, it would be proper to plan on this metal for the needs of future expansion. Any unfair foreign competition can be dealt with by suitable protection as the Government of India have already decided to stop dumping but legitimate competition will have to be faced by rationalisation. The Indian industry should be able to withstand legitimate competition from outside manufacturers who have to get their raw material from several hundreds of miles from the reduction works. The pre-war price of the metal was about Rs. 1,200 a ton and the reasons given for cheap production abroad is the cheap electricity available and cheap ocean transport. If electricity is available at one pie a unit, the cost under this head would work out to below Rs. 135 a ton. If current can be secured locally or from the Rewa Project even at 50 per cent above these rates, a factory would be justified.

The transmission of electricity on a large scale over long distances all over the country now under contemplation will probably justify an aluminium cable works. Railways and other industries should plan for larger use of aluminium alloys in hardware and structural sections. The non-ferrous metals ordnance factory at Katni can be developed after the war to cater for these demands.

The raw materials required per ton of metal are 2 tons of alumina, about 0.6 ton of petroleum coke for electrodes and 0.05 to 0.10 ton of cryolite usually imported from Greenland but capable of being synthesised locally.

The ten-ton plant, with provision for rolling mills, etc., may consume about 12,000 to 14,000 kw. per hour at a high load factor. The proposed Rewa Project, only 76 miles from Katni, offers attractive prospects of giving cheap electricity.

All these industries are best promoted by private enterprise but considerable planning on the part of the Central Government will be necessary.

**74. Limestone.**—Limestone occurs in large quantities over wide areas in the province, particularly in the Katni area of the Jubbulpore district, the Chhattisgarh basin and round about Chanda.

Katni lime enjoys a great and well-deserved reputation and is exported in large quantities. But there is no large-scale consumption

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\*Report on the Development of Industries for War Supplies, by Dr. P. J. Thomas, page 32.

of limestone for industrial purposes in the province itself, except for what is used in the cement works. With industrial expansion, however, the demand for it is bound to increase both within and without the province.

75. **Cement.**—Cement manufacture is of comparatively recent origin in the province. No true portland cement according to the British standard specification had been made in India until 1914.\* There is at present only one cement factory in the province. It is at Kymore and belongs to the Associated Cement Company. The factory's normal capacity is 750 tons a day, but extensions are in hand to increase it to a thousand tons per day. Already this is the biggest factory in India and it is ideally situated with regard to raw products. It serves a large area and is at present working to capacity, mostly to meet war demands. While the demand for cement has been steadily on the increase the industry suffered in the past from over-production and cut-throat internal competition as will be clear from the Report of the Tariff Board on the grant of protection to the cement industry in 1925. The first big step towards rationalisation was taken when the Associated Cement Company merger was formed, a direct consequence of which was the closure in this province of two factories, one at Katni and the other at Mehgaon, both within some 30 miles of Kymore, primarily with a view to increasing efficiency by concentrating production at Kymore. In the result, only one factory producing cement remains in the province at Kymore.

76. The total quantity of cement produced in the country at the outbreak of the war was nearly 15.3 lakh tons per year; it has since gone up to over 20 lakh tons largely as a result of demands in connection with the war. Although this increased output would, in the immediate post-war period, go some way towards satisfying civilian demand, still the total post-war requirements for construction of buildings, roads, bridges, hydro-electric and irrigation works are likely to increase the demand for cement very considerably and it is well to provide for it. While large-scale production is always cheap, yet there are well-recognised limits beyond which the size of a plant cannot be increased and a policy of decentralisation has to be adopted in this, as in other industries, partly to minimise transport costs and partly to secure some measure of dispersal of the industry. This aspect of the matter will be considered further in the chapter on Location of Industry.

77. Two new factories each of a capacity of about 300 tons a day are suggested for construction—one at Rajur, near Wun, and the other in the Raipur-Bilaspur area. The exact location has to be decided after making trial bores and proving raw materials carefully. Both the factories will have the main raw materials, *viz.*, limestone, clay and coal, near at hand. Power will also be available from the proposed Central or Eastern Power Stations referred to elsewhere in the report. The location of the factory at Rajur will also be satisfactory in respect of consuming markets as the nearest cement factories are at considerable distance by rail, Kymore 519 miles to the north and Shahabad 397 miles to the south. The factory in the Raipur-Bilaspur area will have to get coal from the collieries in the Korea State till the nearer mines in the Bilaspur district get into full production. It will find markets right up to the borders of Vizagapatam and if the proposed hydro-electric project in this area (the Machkund project) is taken up for construction, there will be a good demand for cement from the very start.

78. The industry being already well-established can be run by private enterprise, and ordinarily no special Government assistance should be necessary, but considering past experience careful planning of output to keep pace with the demand and at the same time to prevent excessive over-production will be necessary. The growth of new factories will need to be regulated, so that there will be no overcrowding in any particular area. Such regulation will be based primarily on availability of raw materials and markets, but the need to develop particularly backward areas like Chhattisgarh by establishing industries should also be borne in mind.

79. We understand that the Provincial Government has a very large Post-war Road Construction Programme under preparation, the cost of which is likely to be some Rs. 27 crores. We feel that, in spite of its higher initial cost, Government should give undoubted preference to cement over imported asphalt not only because cement-surfaced roads last much longer, and will stand up to wear and tear much better, than asphalted roads, but also because the increased use of cement will have the effect of stimulating the industrial development of the province.

80. **Calcium carbide and cyanamide.**—A recent Geological Survey Report to the Provincial Government\* gives the names of a number of quarries in the Katni area producing limestone suitable for the manufacture of calcium carbide but modern American practice points to the desirability of a higher quality raw material. The magnesia content in the analysis figures of Katni lime exceeds the permissible maximum. It is possible that further investigation will disclose deposits of a higher quality in the area and we recommend that this investigation be taken up without delay as calcium carbide is an important base for the manufacture of ammonia and allied products, acetylene, cyanides, urea, insecticides, and the raw material for gums and plastics. Calcium cyanamide made from the carbide is another important product and is used largely as a fertiliser in various parts of the world, though experiments made in the use of this manure in the province have on the whole not been favourably reported on.

81. **High alumina cements.**—It is understood that certain experiments are in progress at Kymore for the manufacture of high alumina cements. It is also understood that a new process is being tried out in the Jharia coalfield.† It is claimed that by this process a product, superior to even *ciment fondu* in chemical and heat-resisting properties, is obtained. The use of ferruginous bauxite for the purpose also yields iron as a by-product. Considering the importance of the cement as a refractory and for other purposes the question of establishing a factory for producing this cement may be considered as soon as the result of the experiments and fuller information on the subject become available.

82. **Asbestos cement.**—There is a British-owned and British-managed Asbestos Cement Factory at Kymore with a capacity of 18,000 tons per annum. The factory obtains cement and power from the neighbouring cement factory. The other raw material involved is asbestos which is imported from Rhodesia. The products of the factory consist mainly of roofing material and drainage pipes. No State help would be necessary for this industry so long as raw materials of the requisite quality and quantity are not locally available. At the

\*Director, Geological Survey of India's letter No. 18997-187 (4), dated the 30th September 1943.

†Bulletin "O", by Sir Cyril Fox, page 18.

same time efforts should be made (a) to discover fresh deposits of asbestos by an intensive survey of the province, and (b) to find suitable alternative building materials by means of research.

**83. Steatite.**—There are some deposits of good quality steatite in the Jubbulpore district. Analysis of stray samples shows lesser iron, alumina and lime content than even certain grades of beneficiated talc used in foreign countries for the manufacture of insulators and for blending with talc of inferior refractoriness. There is scope for the manufacture of high grade insulators and other electrical goods based on steatite as also of furnace linings but it is not possible to give details of type and capacity of plant and output at this stage.

The processing of steatite for use in the paper, rubber, textile, paint, lubricant and cosmetic industries deserves study and development.

## CHAPTER VI.—CERAMICS AND GLASS

**84. Potteries.**—There are six pottery works in the province. Two of them, fairly large ones in Jubbulpore, concentrate on refractories, including fire bricks, salt glaze pipes and acid-resisting ware. The one in Katni deals exclusively with the refractory requirements of cement factories. The other pottery works are smaller and manufacture earthenware, porcelain and electricware in limited quantities.

Most of these factories are equipped with a number of intermittent coal fired down draught kilns but one of them is also equipped with continuous gas-fired chambers for firing refractories. The smallest factory has two kilns, and the largest as many as 42 kilns capable of a monthly output of 3,000 tons in bricks and refractories.

The province has the advantage of coal and raw materials such as clay, china clay, fire clay, felspar, flint and silica being available in close proximity to one another.

The products of our factories have found markets all over India. The refractories factory at Katni supplies furnace linings for cement factories all over the country. The salt glaze pipes from Jubbulpore find markets as far away as Travancore.

There is scope not only for the expansion of existing, but also for starting new and up-to-date, factories.

**85. Porcelain and Insulator Factory.**—We consider that in the immediate future a factory equipped with gas-fired tunnel kilns for the manufacture of porcelain and electricware with an output of eight tons per day would be justified. The factory may be located in the Chanda, Nagpur, or Jubbulpore area according as a detailed survey of raw materials may indicate. In an industry like this, production costs are vitally influenced by cost of transport of raw materials and too much attention cannot be paid to a study of the correct location of the factory with reference to raw materials.

With large-scale electrification all over the country, the demand for electricware is bound to attain considerable proportions. Telephone and telegraph extension will require a steady supply of insulators. While such a basic demand will keep the factory in production, the manufacture of porcelainware can also be undertaken side by side and developed. Larger markets for these products will be available with rising standards of living. The factory can also take to other miscellaneous items of manufacture, like the steatite insulators already mentioned.



Sanitary tiles and fittings, acid jars and other stoneware are also articles which will find a growing market in the post-war period. Owing to the proximity of coal to clay and other raw materials required for the industry, production costs will be low and the product will find markets in the area south of the province and in adjoining territories where conditions for manufacture are not so favourable as in this province. Central Provinces coals have proved to be satisfactory for the production of gas and as new factories will use gas-fired kilns, the fuel position is most satisfactory. Producers for generating gas have been made locally and have given reliable service.

Power requirements may be of the order of 300 Kw. and will be available at reasonable rates from the local electricity supply undertaking.

**86. Refractories Factory.**—One refractories factory in the Katni area with a minimum capacity of 50 tons a day will be justified to meet the inevitable demand of refractories for chemical and metallurgical works to be established in various parts of the country in the post-war period. The raw materials—fire-clay, bauxite and silica—are available near enough and the coalfield is also not far away. The nature of the products will be decided by market requirements and detailed planning will have to await further developments.

As the area is likely to develop rapidly as an industrial centre, it should be easy to provide power required for the industry on acceptable terms. There is already a fair-sized generating station which will have surplus power as soon as the present war demand for electricity abates.

**87.** The industries so far mentioned in this chapter are, if possible, best promoted by private enterprise, but in the case of the insulator factory Government should, in view of its obvious importance, take 10 per cent of the share capital. Even otherwise, Government help will be necessary in regard to mining concessions, transport facilities and technical advice. Government can help the industry very considerably by undertaking a detailed survey of raw materials and this point has been emphasised by all interests. The survey will have to include not only location of deposits but analysis for quality and estimates of quantity. With such surveys, recommended by us, experts engaged in the industry concerned should be associated. Research will be necessary on processes of concentration and beneficiation of minerals. The appropriate department of Government should also look into the methods of manufacture by smaller concerns and suggest economies which will result in the saving of fuel and elimination of wasteful working. Improving the quality of the finished product and standardising it in such concerns should also receive attention. The porcelain industry will need a certain measure of protection for some time in the post-war period if it has to be established on a firm footing as our factories have not been able in the past to compete with the *cheaper* and *superior* Japanese products.

**88. Tiles.**—Machine-made tiles of the Mangalore pattern are manufactured in this province mainly in Bagra near Itarsi in the Hoshangabad district. The output meets only a small part of the demand for tiles in the province and there is good scope for medium-sized well-planned units in a few selected centres in the province. A survey for suitable clays should be made and samples subjected to firing tests. The industry ought to be run by private enterprise but the Department of Industries should render assistance by giving technical advice in the planning of the factories.

89. **Glass.**—There are six glass factories in the province. These units are small but fairly well-distributed. They all produce hand-made blownware by substantially the same methods. Nearly all of them make quantities of blown tumblers of the cheapest variety, while the bulk of their production is in hurricane lamp chimneys and other lampware. The normal manufacture includes stoppered glass jars, bottles, lamp-shades, *lotahs*, paper-weights and other miscellaneous articles. One established factory has attached to it a power press works producing metal stampings for lamp parts. The furnaces employed in these factories are what are known as the "Japanese type", a type of furnace containing a number of covered pots and enclosed in a fire brickdome. The pots are usually fired by coal in an open grate and the necessary draught is supplied by a chimney. One factory has, however, now adopted gas firing. The largest of these factories has a capacity of 2 to 4 tons of finished glass per day.

90. The raw materials required for glass are sand, soda ash and lime. About 12 cwts. of sand of purity as high as 99 per cent silica is required per ton of glass. All the factories of the province have to import this sand from the United Provinces except the one at Jubbulpore which has a deposit of the material at site, and the one at Gondia owned by the Jubbulpore Company which gets its sand from Jubbulpore. Even this sand has to be washed before use to remove kaolin and other impurities. Soda ash which is the most expensive of the various raw materials has to be imported. About 5½ cwts.\* is used for a ton of glass. Burnt lime of excellent quality for making glass is available in various parts of the province and is actually exported to the United Provinces and Bengal for similar purposes from Katni. About 2½ cwts.\* of burnt lime is used per ton of glass. The other chemicals required are used in small proportions. Refractories for furnaces and pots are an important item in glass manufacture. The better quality Jubbulpore fire-clays are excellent refractories for temperatures below 1350° C, a temperature which is rarely exceeded in the ordinary pot furnace. A new refractory known as sillimanite has created world-wide interest in the glass industry. This material may be suitable also for tank furnaces. Deposits of sillimanite and a somewhat similar but less satisfactory material, kyanite, exist in the States adjoining the province and in small quantities in Bhandara. Pots manufactured from Jubbulpore clay and "grog", i.e., broken pieces of old pots are now being used and reported to be better than the pots which used to be imported from Japan. As regards fuel, local coals which are of inferior grade are not in favour, as the furnaces in use are inefficient and much loss and inconvenience would occur if the glass is not ready for working in time. The solution is obviously to convert the furnaces into gas-firing ones, for Central Provinces coals are very satisfactory for producer gas generation. This will also result in fuel economy. The present fuel consumption can be taken as about 2.5 tons of coal per ton of finished glass.

91. The export and import figures of glass for the province are as below :—

	1937-38	1938-39	1939-40	1940-41	1941-42	1943-44
Imports in tons† ..	1,404	1,478	1,368	1,367	1,157	658
Exports in tons† ..	696	734	774	863	1,023	382

\*Vide estimate contained in the *Report of the Tariff Board on Glass*, 1932, page 71.

†Accounts relating to Inland (Rail and River Borne) Trade of India for March 1938, 1939, 1940, 1941, 1942 and 1943, published by the Department of Commercial Intelligence and Statistics, India.

Figures of actual production in the province are not available. The production capacity of our factories is estimated to be about 5,000 tons a year, but this capacity is not fully used. There is thus scope for replacing imports and improving exports. Glassware being fragile and not easy to transport, the general tendency will be for the small factories to establish themselves near the markets rather than near the raw materials. It would be a more prudent policy to develop local markets by improving the products of the existing factories, increasing the lines of manufacture and displacing imports than to dump cheap goods of indifferent quality into other markets. To attain this object existing factories will have to be remodelled and improved. The defects of the present manufacturing methods have been brought out clearly by the Industrial Research Bureau in 1936 in a publication entitled *A Survey of the Glass Industry*. Unfortunately the industry does not appear to have profited by the suggestions made in this excellent brochure. The first and the most important step will be to improve the furnaces. At present the temperature attained in these furnaces does not appear to be sufficiently high and sustained to melt the batch material to produce glass of the desired composition satisfactorily. To meet this deficiency, makers are obliged to increase the soda content and decrease the lime content of the glass. The result is that a greater quantity of the expensive soda ash is consumed and the finished glass is inferior and dull in appearance owing to a lower refractive index and liable to break when subject to changes of temperature because of a higher co-efficient of expansion. Another reason for the poor quality of the glassware produced is the lack of supervision. A high standard is not insisted on by the management and no inducements are offered to blowers to attain it. Almost any work is accepted. This has been particularly so of recent years, when, owing to lack of competition, almost any product finds a market. Production has thus greatly deteriorated in quality which must be remedied and new standards set. Another unsatisfactory feature is that the average Indian glass sand contains an excessive amount of iron and as a rule no attempt is made to wash it of impurities. These impurities lower the quality of the glass produced. For the bulk of the glass produced, tank furnaces may be more economical and suitable. This is again a matter of furnace design needing investigation. At the same time the most suitable method of waste heat recovery should be adopted. The new Silicate and Glass Research Institute will no doubt study these questions. The Provincial Industries Department should see that the results of such investigations are made available to the industry. The demand for glassware is increasing and there is no reason why most of the glass required should not be manufactured in the country, if the improvements in manufacture indicated above are carried out. As a first step, however, it is suggested that existing factories in the province should be modernised and expanded to meet the demand. There may be scope later for more factories, but for the present at least, there appears to be little scope in the province for large factories producing on a mass scale.

92. The Government help required for the industry in the matter of technical advice has already been touched upon. As our main proposal is to improve the existing industry, it may be an advantage to attach to the Industries Department for a limited period of years an experienced glass worker from abroad whose duty it will be to improve the quality of the present production by adopting up-to-date methods of manufacture. His remuneration should depend in part

on the results achieved. It is expected that the industry will welcome such a step and will give Government all the co-operation necessary to make it successful. Further as in the case of the ceramic industry, a survey of mineral raw materials should be undertaken. The position of the industry with regard to foreign competition has been dealt with by the Tariff Board in 1932 and there is no doubt that, after the war, when normal trade conditions return, the industry will have to be protected.

## CHAPTER VII.—TEXTILE INDUSTRY

93. **Cotton.**—Some 35 years ago, the Central Provinces and Berar was the most famous cotton-growing region, and had the largest area under this crop, in India. In recent years, however, it has lost its pride of place to Bombay Presidency, but cotton is still the most important cash crop of the province. The area under cotton during 1944-45 is estimated at 28.18 lakh acres, but this is only just a little more than half the area under the crop during the boom years following the last war. Production has varied in the last five years from 5.5 lakh bales to 10.08 lakh bales, the average being about 7 lakh bales. Out of the provincial production, about 1.8 lakh bales or roughly 25 per cent is consumed by the local mills and the rest was exported largely to Japan, in pre-war years. About 75 per cent of the area is now under medium staple cottons like *buri*, *cambodia*, *jarilla* and *verum* (staple length 12/16" to 15/16"), and 25 per cent is under *oomra* cotton with a staple length varying from  $\frac{1}{2}$ " to  $\frac{3}{4}$ ".

94. The area under medium staple cotton has assumed the present proportions only in the last two or three years. Previously about 90 per cent of the area used to be under the short staple varieties. The improvement of the cotton crop has a long history in the province. The earliest attempts to introduce American cottons were made in the last century, but these failed, and all that is now left of them are *cambodia* and *buri* found growing in certain districts. In the early years of the present century, attempts were made by the Agriculture Department to select a high-yielding strain from the local mixture known as *jari*. This resulted in the isolation of the *roseum* cotton which became very popular with the cultivators on account of its high ginning percentage, and for some years it covered the whole of Berar. It brought large sums of money into Berar in the years immediately following the last war, as it was in great demand in some European countries, but, as it was found susceptible to wilt, had to be abandoned.

95. From 1923 onwards, all cotton improvement work has been done under the auspices of the Indian Central Cotton Committee. The aim has been to produce medium staple and wilt-resistant strains. *Verum* 262 was the first of these improved strains, and in 1932 it occupied 1.64 lakh acres. It was, however, liable to damage by late rains and was, therefore, substituted by late *verum* and by *verum* 438. Neither of these made much headway. The next strain to be evolved was *verum* 434, a good cotton with a soft lint, 7/8" long and capable of spinning 20's to 24's. This became very popular, and with the demand for medium staples, the area under it went up to 6.66 lakh acres in 1942-43. Another cotton evolved by the department is *buri* 107, which is an acclimatized American variety with a fine lint, 7/8" to 31/32" long and capable of spinning up to 30's standard warp. This cotton has become very popular in the Burhanpur tahsil and the total area under it is about 1.3 lakh acres.

96. When Japan went out of the Indian market the export demand for short staple cottons declined all at once, and a demand suddenly arose for medium staple cottons, which the Agriculture Department and their improved strains were unable to meet. There was at the same time across the border in the Bombay Presidency a cotton known as *jarilla* which in quality was only equal to *verum* but gave about 2 per cent higher ginning outturn. The merchants and the gin owners favoured this cotton for its higher ginning percentage and started importing and distributing the seed in large quantities. This cotton had already obtained a foothold in the Buldana district as early as 1939 and in 1943-44 covered an area of 13.74 lakh acres as against 2.73 lakh acres in the previous year. *Jarilla* has swept all the departmental strains off their feet and the area under these latter, already small, has become smaller still. The last two seasons have, however, not been favourable for *jarilla* and it is reported that it has deteriorated more than *verum* on account of unfavourable climatic conditions and has therefore lost some of its original popularity. *Jarilla*, however, came to the rescue of the cultivator at a critical time and helped him to remain in the market. When the export markets shrank, the cotton-growers of Berar would have lost heavily had they stuck to *oomra* cotton.

97. The cotton improvement work of the province is being done on such a small scale (the average expenditure for the triennium 1939-42 on all research carried out by the provincial Agriculture Department being only Rs. 1.6 lakhs) that it would take very many years for any of the new strains to create an impression on the markets. It is therefore essential to increase the staff several-fold to make the work commensurate with the importance of the crop in the economy of the province. The aim should be to produce a cotton which combines a high ginning percentage with good field outturn and medium staple. The question of growing long staple cotton under irrigation as a rabi crop is also worth serious study and research. It is also necessary to take statutory measures to prevent the indiscriminate mixing of different varieties by merchants and growers; and also to provide for more extensive and more efficient seed distribution which would maintain the purity of the improved strains. The future of the province as an important cotton-growing area depends upon the vigour with which these and similar measures are pursued.

98. Mills.—The cotton mill industry in the Central Provinces and Berar dates back to the year 1877 when the Empress Mills were started at Nagpur by that great Indian pioneer industrialist, the late Jamshedji Tata, to whom belongs the credit of foreseeing Nagpur as a great centre of textile manufacture. There are at present 10 cotton spinning and weaving mills in the province of which Nagpur, Hinganghat and Akola have two each, while Pulgaon, Badnera, Ellichpur and Burhanpur have one each. Statement No. XI gives a bird's eye view of the textile industry in the province during the cotton year 1942-43. An examination of the statement would reveal the following characteristics of the industry :—

- (i) A large amount of capital has been invested in the industry which employs nearly 30,000 workers;
- (ii) two mills, viz., the Vidarbha Mills and the Model Mills, which were established soon after the last war were naturally over-capitalised;
- (iii) the industry has a disproportionate number of spindles compared to the loom capacity; and
- (iv) it partially satisfies the demand for yarn of the nearly 73,000 handlooms in the province.

Practically all the mills in the province spin coarse counts of yarn mostly from 1's to 20's and to a small extent up to 32's from the local cotton and cotton from adjoining provinces and the cloth produced is sold mostly in grey loom state. Small quantities of finer yarn and cloth are, however, produced by the Empress Mills.

**99. Markets for (1) yarn and (2) cloth.**—The chief market for the coarse yarn produced is mainly the handloom industry of this province and the adjoining provinces of Bihar and Orissa. As regards cloth, the principal market is within the province itself but some of our cloth goes over long distances and finds a ready market in Cawnpore, Calcutta, Amritsar, Agra and Cuttack, where there is always a demand for it.

Except for the Empress and the Model Mills, which are big units, most of the others are medium-sized and most of the machinery installed is of British make and, though not up to date, is of the average kind found in India. With the exception of a few mills, all have out-of-date reciprocating steam engines for their motive power and only one or two have economic extraction turbines.

Statements Nos. XII and XIII annexed give the figures of production of cloth and yarn, and show how in comparison with 1937-38, the production has increased in the year 1941-42, owing to the prevailing war conditions. It would appear that the yarn spun is restricted to counts below 30's and that very little cloth is bleached, dyed, finished, raised, printed or mercerized. The bulk of the manufacture is of dhotis, longcloths and khadis.

**100. Handlooms.**—As stated earlier in this report, India has produced hand-woven cloth from time immemorial, but with the advent of the machine-made article, the produce of the handloom industry has been on the decline, and production is gradually restricting itself to multi-coloured and artistic fabrics which could not be made economically by the mills. The Swadeshi movement gave a fillip to the handloom industry but it was short-lived.

**101. Small-scale industry: Powerlooms.**—The increasing popularity of small-scale powerlooms is a significant feature of the textile industry. There are at present about 520 powerlooms operating in small weaving factories and cottages in this province, out of which 470 are working at Burhanpur and 50 at Jubbulpore. By combining a high degree of efficiency with decentralised production, small-scale powerlooms have a definite future and it is reasonable to expect that with the availability of cheap power in rural areas, the handloom weaver of today will gradually take to powerlooms and thus solve some of the problems of the handloom industry.

In view of the existing difficulties, we consider that Government should ensure that the handloom industry obtains its supplies of yarn.

Further aspects of the handloom industry are dealt with in the chapter on small-scale and cottage industries.

**102. Ginning and Pressing Factories.**—The number of cotton ginning and pressing factories in the province fell from 617 in 1929 to 394 in 1943 indicating that so many factories were not actually required to handle the cotton grown in the province. The large number of ginning and pressing factories in the earlier year was due to the cotton boom of 1920-28, when cotton fetched very high prices. But with the setting-in of the slump, prices fell and the acreage under cotton also dwindled and the ginning and pressing industry suffered a severe set-back. The owners found that it was uneconomical to

work all the gins and presses and therefore resorted to the "pool system". "A pool is a combination of factory-owners for the purpose of charging a common rate, subject to certain conditions which are binding on all those who participate in the pool. \* \* \* \* All owners who possess factories in working order or who are in a position to bring their factories in working order at short notice are invited to join in the pool. If an agreement is reached, certain rates for ginning and pressing are fixed and none of the factories is permitted to charge anything less than the rate fixed by the pool. A custodian is appointed to manage the pool, to collect the pool quotas and to distribute the proceeds amongst members of the pool. \* \* \* \* The rate to be fixed by the pool is based on the cost of production and distribution of profits. The portion representing the cost of production is to be retained by the factory which may be working and the portion representing the pool quota is paid over to the custodian for distribution amongst members. The distribution is *pro rata* to the number of gins and presses owned by the various members".\*

The pool system resulted in pushing up the rates for ginning and pressing and brought down the price of cotton. The evil reached such proportions that Government had to intervene and appoint the "Central Provinces and Berar Cotton Ginning and Pressing Factories Pools Committee" in 1939. The Committee recommended that maximum rates for ginning and pressing should be fixed by statutory committees wherever required, but found it unnecessary to eliminate the pool system completely.

We would suggest that the present ginning and pressing factories should be modernised with a view to securing greater efficiency. No more factories than are sufficient to deal with the cotton available should be allowed to be built. To make running economical we suggest that the Provincial Government should give them reasonably cheap electric power, if possible, from the thermal station which they are planning. We also consider that, wherever possible, methods of co-operative ginning and pressing may be encouraged among cultivators. In no circumstances, however, should the staple, feel or colour of the cotton be allowed to be damaged by malpractices on the part of gin and press owners, merchants or cultivators and this should be secured, if necessary, by legislation. It must be borne in mind that the ginning and pressing factories play an important part in determining the quality, and maintaining the reputation, of our cotton.

**103. Expansion of the textile industry visualised.**—The expansion of the textile industry has two aspects, *viz.*—

- (i) the modernisation of the existing mills, and
- (ii) the establishment of new mills.

(i) **Modernisation of existing mills.**—The first and most important step is replacement of machinery. The machinery of most of the mills is as old as thirty to thirty-five years or even more. Owing to the pressure of war orders, the mills have had to work double shift and manufacture heavier types of cloth than those for which the machines were designed, causing great wear and tear and making early replacement of the machinery necessary. We assume that the replacement programme will be completed within the next five to seven years, to the extent of 50 per cent of the entire weaving and spinning plants. We recommend that as high a priority as possible should be given for textile machinery requirements. In carrying out the replacement

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\*Central Provinces and Berar Cotton Ginning and Pressing Factories Pools Committee's Report, paragraph 10.

programme care will no doubt be taken in the interests of rationalisation to modernise the layout and order nothing but the latest type of machinery. This by itself should increase the efficiency of the mills considerably. We emphasise the question of efficiency as it is often alleged that the textile industry in India has failed to put its house in order.

(ii) Establishment of new mills.—The following is the basis of our proposals :—

- |   |                                |
|---|--------------------------------|
| (a) Population of the Central Provinces and Berar.  | 16.8 millions.                 |
| (b) (1) Present production of the mills with 341,135 spindles and 6,130 looms, assuming that all the looms would be working double shift all the year round with a production of 50 yards per shift per loom against an actual production of 95,000,000 yards in 1941-42. | 184 million yards.             |
| (2) The production of 73,000 handlooms according to the Fact Finding Committee's Report, 1942.  | 84 million yards.              |
|   | Total . . . 268 million yards. |
| (c) Provincial requirements of cotton piecegoods on the basis of 30 yards per head of the population according to the Bombay Plan of Economic Development of India, paragraphs 12 and 13.   | 504 million yards.             |
| (d) Deficit in cloth production, assuming that there will be no exports and imports.  | 236 million yards.             |

As we need 236 million yards of extra cloth, there is scope for new mills to the extent of about 8,000 looms and 200,000 to 250,000 spindles, assuming that all the machinery would work double shift of nine hours each and that there would be no exports or imports. It is true that it will take some time to reach the target of 30 yards per head per annum, but it should not be forgotten that certain provinces such as Bihar and Orissa which do not grow any cotton depend even at present on our supplies of cloth and yarn and the expansion indicated above is not unreasonable.

104. The following points require consideration in any textile industry expansion programme :—

- (i) Raw cotton.
- (ii) Stores.
- (iii) Labour—skilled and semi-skilled.
- (iv) Power.
- (v) Transport.
- (vi) Markets.

(i) Raw cotton.—We have already dealt with the question of cotton and the scheme of expansion contemplated would lead to the utilisation in the province of some of the cotton now exported. It may be recalled that present exports amount to about 80 per cent of production.

(ii) Stores.—The chief items under this head are sizing, finishing and dyeing materials and a variety of chemicals and accessories most of which are normally imported from foreign countries.



Efforts have been successfully made to manufacture some of the stores in India during recent years and there is reasonable prospect of making the following items also in this province :—

(a) Sizing materials—

(i) Weighting materials such as china clay and Glauber's salt.

(ii) Adhesives such as starches, dextrines and gums.

(iii) Softeners such as vegetable tallows, turkey red oil.

(b) Chemicals such as (i) sulphuric acid; (ii) sodium sulphide;

(iii) tannic acid; and (iv) bichromates.

(c) Other stores—

(i) Wooden—such as bobbins, picking sticks

(ii) Leather—such as raw hide pickers, buffers, roller skins, belts and picking bands.

(iii) Labour—skilled and semi-skilled.—We do not anticipate any difficulty in obtaining the extra labour required, but the question of rationalisation of labour and increasing it efficiently will have to be considered.

(iv) Power.—Most of our mills have out-of-date generating plants. We therefore strongly support the proposal to install a Central Thermal Station in the Nagpur area so that power may be available at reasonable rates in the main cotton-growing areas of the province for the development of the textile industry.

(v) Transport.—The province is centrally situated and the existing road and railway transport facilities when supplemented by the large post-war programme of road expansion contemplated by the Provincial Government will be reasonably satisfactory for the purpose of the expansion of the textile industry.

(vi) Markets.—As has already been indicated, the requirements of the province alone would justify considerable expansion of the industry. Besides we have convenient external markets in the provinces of Bihar and Orissa and elsewhere.

105. While considering the question of the size, capacity and location of new mills, we should bear in mind the fact that at present there is an excess of spindles over looms. All the existing mills are equipped to spin coarse yarn and most of them have no bleaching, dyeing, mercerizing and printing equipment, with the result that all of them produce the same types of goods resulting in heavy internal competition. The all-India figures are interesting. There are in India today 401 mills, of which only about 105 cotton mills are equipped with dyeing, bleaching and finishing departments, only 61 with combing plants, 17 with mercerizing machinery and 21 with printing plants. Thus, it will be easily understood that the textile mill production is unduly concentrated on a partial range of variety for which there may not be such a heavy demand in the post-war period.

106. The weaving side of the industry will have to be completely readjusted so far as varieties of cloth and fancy manufactures are concerned. In place of the very coarse, heavy, sized grey long cloth, dhotis and saris which are now produced in large quantities, in future the mills may with advantage specialise in superior shirtings, fine and medium quality dhotis and saris, printed goods, dyed goods, mercerized fabrics and more fancy varieties, which will necessitate the introduction of dobbies, jacquards, multiple-box looms, combing, bleaching, printing, finishing and mercerizing plants. This change in the structure of the cloth will require finer types of cotton and we have already recommended that the Agriculture Department should conduct research with a view to improving the cotton staple and thus

meet the demands of the industry. But so long as these improved varieties of cotton are not available locally, cotton from the Punjab and Sind and even from Egypt and America may be imported. As regards the actual layout of the mills, we leave the matter to expert designers. We, however, consider that a mill having 500 looms and 20,000 spindles is an economic unit and about 16 such units may be justified in this province. A beginning may, however, be made by starting mills in suitable places like Wun, Chanda and Pulgaon with power from the Central Power Station contemplated by Government. Outside the power station area, places like Akola and Malkapur are also worth consideration, in view of the natural advantages as regards labour, water, cotton, etc. they possess. If it is not possible for the central thermal station to supply these areas, the mills at these places might install their own extraction turbines and be allowed to supply electricity at controlled rates to other industrial undertakings and/or to the public, thus making the supply cheaper all round. When the southern thermal station at Chanda and the Penganga hydro-electric system come into operation, these could be linked up with them.

#### CHAPTER VIII.—INDUSTRIES BASED ON AGRICULTURAL, FOREST AND ANIMAL PRODUCTS

107. The most important agricultural products of the province, apart from foodgrains, are cotton and oil-seeds. Cotton we have already dealt with in the previous chapter. We now proceed to deal with oil-seeds. India is the biggest producer of oil-seeds in the world as will be seen from the following statement :—

(1937 figures in million tons)		
India	...	8.0
China	...	7.0
U. S. A.	...	4.3
Argentina	...	2.0
Russia	...	1.9
Nigeria	...	1.0
Dutch East Indies	...	0.6
Total	...	24.8

The Central Provinces is one of the more important oil-seed producing provinces of India; the total quantity produced amounting to under half a million tons: see statement No. XIV annexed. In addition to those given in the statement, other oil-seeds are also produced for which no statistics are available; *mahua* is one such. The area under groundnut has expanded a great deal since the beginning of the war. It rose from 2.28 lakh acres in 1939-40 to 5.16 lakh acres in 1944-45.

At present we export a good proportion of the oil-seeds we produce and import considerable quantities of oil, as will appear from the statement. This is unnecessary, as, excepting for a limited quantity of cocoanut oil, all the other oil requirements of this province can be met by increasing local crushing capacity.

If nutrition experts are correct, then one of the causes of malnutrition among the masses is insufficient intake of oils and fats. Increased production of oils is therefore necessary.

Oil milling as an industry is best localised at the centres of oil-seed production, since the cost of seed, which is the main item, is much lower than at Bombay or Calcutta, where the industry is now concentrated, and even as regards the other items of cost—coal and labour, this province is very favourably situated. Power costs will also be low when the new electricity schemes are implemented.

The development of the industry will create employment, not only in the oil mills but also in the various allied industries which will follow in its wake.

The chief industries based on oil-seeds are oil milling, refining and vegetable ghee (Vanaspatti), soap and glycerine, paints, varnishes, lacquers, oil cloth rexine, artificial leather, and oil cake products like plastics.

**108. Oil milling—Present position.**—There are 43 power driven oil mills registered as factories, employing about 1,800 persons and about 17,000 *ghanies*. They crush mainly linseed, small quantities of groundnuts and *til*, and a certain amount of *mahua* and castor. There is hardly any crushing of cotton seed, though it is one of the most important oil-seeds produced. The mills in the province are all small units, most of them using only one or two expellers. The machinery is old and worked without expert supervision. The factories being all small, cannot afford to employ highly qualified staff, and are therefore inefficient.

**Recommendations.**—The first essential step is to increase the total milling capacity and introduce modern methods of working. An increase in crushing capacity by  $2\frac{1}{2}$  times from the present estimated 120,000 tons to 300,000 tons is recommended. This would mean that exports will be cut down by half and that the cotton seed that is not now utilised locally will be crushed for oil.

As against the present small-sized units of 6 to 12 tons crushing capacity, which are uneconomical, we suggest that, where conditions warrant, the minimum capacity should be from 40 to 60 tons of seed crushed per day. This would mean that at least 20 to 25 modern factories will be required to crush 3 lakh tons per year. Each of these factories would require about 100 Kw. of power the total power required by the industry being thus in the region of 2,000 to 2,500 Kw. The type of machinery required would depend on the seed crushed, expellers being best suited for groundnut, a combination of expellers and hydraulic presses being suitable for others, particularly *mahua*.

We do not favour the centralisation of oil milling industry in one locality, any more than other industries, and it is best to have mills scattered all over the province, each drawing its oil-seeds from the region around it, thereby eliminating unnecessary cost of transport.

The other important development we would recommend is the milling of cotton seed. While in other countries, notably America, cotton seed is crushed, the oil extracted and refined for purposes of human consumption, and the oil cake fed to cattle, we, in this country, do not do this, although cotton seed production is second only to groundnut in importance. Indeed, in the Central Provinces, cotton seed actually occupies the first place as out of 4.3 lakh tons of oil-seeds produced, cotton seed leads with 1.88 lakh tons (quinquennial average).

It may be added that in America cotton seed oil serves the same purposes as olive oil in Europe. It is wasteful to feed cotton seed to cattle as they thrive equally well on the cake and do not require all the oil in the seed.

In order that cotton seed may be milled, special delinting and decorticating machinery, adapted to suit the Indian seed, will have initially to be obtained, preferably from America. Better care in storage is also required, as the seed deteriorates easily in India.

The industry depends to a great extent on the price that the oil cake fetches, and in peacetime this was entirely controlled by the London market as most of the oil cake produced in India was exported. The measures that will help the industry are the utilisation of the oil and oil cake in India itself. For this research is badly required, and we have recommended elsewhere the establishment of an oil research institute.

**109. Promotion, ownership and management.**—This may be left to private enterprise, but if private interests hold back for any reason, a small factory for crushing cotton seed must be started, if necessary with State help.

State assistance required.—The first serious handicap is that prices of oil-seeds and cake are controlled entirely by the London market to the prejudice of the Indian industry. In the case of linseed, for example, the price of Argentine linseed controlled by London can affect Indian prices adversely. The only solution appears to be to discourage export of seed and cake by all possible means.

A proposal is now before the Government of India for the levy of a cess of one anna per maund on oil-seeds crushed in power-driven mills in India. It is to be feared that this measure will have an extremely undesirable effect on the oil-milling industry in India, as the cess would be borne only by the industry while the oil-seed exported out of India would escape completely. In our opinion, the cess should be levied both on seed crushed and exported. This will have the desired effect of bringing in money for research and at the same time discouraging export of seed.

At present many transport facilities exist for the export trade but few for the internal trade. This requires alteration, see the Chapter on Transport.

We are of opinion that the Government of India should encourage private capitalists to establish a central factory for the manufacture not only of oil-milling machinery but also of expeller spare parts and obtain priority for the requisite plant.

**110. Vegetable ghee or Vanaspati**—Present position.—There are no factories at present in this province, although a few are under contemplation. The main raw material is groundnut oil which is available. Cotton seed oil which is also very suitable can also be produced.

The rapid growth of this industry in India during the last few years and the parallel growth of the similar margarine industry in Europe, would appear to indicate that there is good scope for expansion in the post-war period.

**Recommendations.**—The smallest economic unit for a vegetable ghee factory is 20 to 25 tons of the finished product per day. The hydrogen required in the manufacture is best produced by electrolysis of water, which is the method adopted in most factories in India, unless by-product hydrogen is available from a nearby caustic soda plant.

The main requirements for a vegetable ghee factory are oil, coal, electricity and water. The power requirements both for electrolysis and general power purposes would be in the region of 600 Kw. but if the hydrogen required is obtained as a by-product, the electricity required for power purposes only will be about 150 to 200 Kw.

The main item in the cost of manufacture is the cost of the raw oil; vegetable ghee factories are therefore best situated near the oil extraction centres. Electricity being an important item of cost, it should be obtainable at an economic rate.

A major item of cost is the cost of tins, and it is economical for each factory to have its own can-making plant. In this respect, the province is well situated, not far from Tatanagar from where the tin sheets come.

There is scope for some four factories in this province, three of them being situated in the groundnut and cotton-growing tracts of Nagpur, Wardha and Berar, and the fourth in the Chanda district where caustic soda will be produced. With a daily production of 25 tons each, the four factories will have a total output of approximately 30,000 tons vegetable ghee per year. These factories should preferably be of the composite type, milling the seed, hydrogenating the oil and making soap utilising the by-product, soap-stock. As the other by-product, oxygen, is in demand in hospitals and as oxyacetylene for welding in engineering workshops, bottling and sale of oxygen are also necessary for economical working. The bottling and sale of oxygen are now a monopoly in India of a British concern, the India Oxyacetylene Company, which has dealings with the various vegetable oil factories in India, buying the oxygen at a very low price. The bottling and sale of oxygen should be encouraged independent of this monopolistic concern.

If a good workshop is available it should be possible to manufacture much of the machinery locally, thereby reducing capital costs. Hence the need for a workshop regarding which we have made a recommendation separately.

Promotion, management and ownership.—This should be left entirely to private enterprise. But every help should be given to these factories by the State.

**111. Soap**—Present position.—There are 25 soap factories in this province, nearly all of which manufacture soap by the indigenous semi-boiled process, in primitive fashion in iron pans heated by direct fire. They are small in size and the quality of the product is very poor. They produce washing and toilet soaps of the cheap variety. Milled toilet soap, such as is produced in Bombay and Calcutta, is not produced in these factories. Local factories consume at present about 18 tons of caustic soda per month, and on this basis, their annual production may be taken at approximately 1,500 tons. As caustic soda is rationed on a 50 per cent basis, their pre-war annual capacity may be taken at 3,000 tons.

**Markets.**—Large quantities are imported into this province, mostly from factories in Bombay and Calcutta. The extent of such imports is not known, however.

The consumption of soap is likely to increase in future day by day with increase in the standard of living. In estimating post-war requirements, the only suitable guide is the *per capita* soap consumption in various countries. The following figures of consumption of

soap in pounds per head of the population in various countries during 1934 are interesting :—

U. S. A.	..	..	23*
Holland	..	..	22*
Denmark	..	..	20*
Great Britain	..	..	18*
Canada (1937 figures)	..	..	17*
Poland, Jugoslavia, Roumania and Bulgaria each			4*

Since 1934, soap consumption has most probably increased considerably in Europe and America, but if we assume as our target 4 lbs. per head, the lowest in the west, we would require some 30,000 tons for this province. Even assuming one half of it as the target for the next few years, we would require five times the soap that is produced today.

**Raw materials.**—The chief raw material is vegetable oil which abounds in the province. Small quantities of cocoanut oil have however to be imported for some soaps. To impart hardness to the soap, tallow or *mahua* oil can be used, both of which are available in large quantities. Although *mahua* seed is available in plenty, it is not crushed to any great extent in the province but is exported to Bombay and Calcutta. The other raw material, caustic soda, can either be manufactured as proposed elsewhere or even imported.

In addition to the soap required for domestic and toilet purposes, there is a growing demand from the textile mills for industrial soaps for which suitable oils are available.

**Recommendations.**—The type of manufacture recommended is by the boiled process using steam. Extensive production of boiled soap will, in course of time, drive out of the market the crude and harmful type of soap now being made.

For the recovery of glycerine which is now wasted, a central distillery should be established in the province. Apart from its use in the manufacture of explosives, glycerine is useful for making certain synthetic products, varnishes, etc.

**Location.**—Unless it be a mammoth factory like that of Lever Brothers, it is best to have the factories distributed all over the province, each supplying its own surrounding area, thereby cutting down transport and other charges.

**Management, promotion and ownership.**—These should be left entirely to private enterprise.

**112. Paints, Varnishes, Lacquers, Enamels and Distempers.**—**Present position.**—Hardly any paints, varnishes or lacquers are produced in the province. A new factory has been started in Katni for making about 600 tons of oil paints but it has not yet started manufacturing. The paint factories in India are concentrated mostly in Bombay and Calcutta.

**Markets.**—Figures regarding provincial consumption of paints, etc., are not available, but the all-India estimate was 40,000 tons for 1938. Of this about 40 per cent was met by imports from abroad.

**Recommendations.**—In the manufacture of oil paints, the main item is the cost of linseed oil which is produced locally in large quantities. The province is rich in certain pigments, notably yellow ochre and red ochre. Barytes is also available. If alumina is produced from our bauxite, titanium oxide, which is a by-product and a valuable pigment for white paints, can also be made.

As we have shellac and propose to produce glycerine, formaldehyde, methanol, acetone, etc., it should be easy to produce varnishes and plastics.

Size of factory, type, location, etc.—The factories should be situated near the raw materials and markets. The size is not important, but a factory should have at least a production capacity of 500 to 600 tons of paints per year.

Ownership, promotion and management.—Entirely private.

Assistance required.—A tariff on imported paints, varnishes and lacquers is essential for the development of the industry.

**113. The Orange Industry.**—The Nagpur orange has a reputation even outside the shores of India as the most delicious fruit of its kind. Some years ago a few consignments of this fruit were sent to a famous firm of fruiterers in London who declared it the best of its kind they had ever seen.\* The Nagpur orange finds a ready market in all parts of India, from Peshawar to Cape Comorin and from Karachi to Shillong. At the beginning of the present century, the area under orange in the province was estimated at one thousand acres and the value of the trade at about Rs. one lakh. Today the area is about 30,000 acres and the production is about a lakh tons of fruit per year, valued at about Rs. 2.5 crores. The area is increasing at the rate of about 1,500 acres a year. Only about 50 per cent of the area is in full bearing at present. In another five years, it is estimated, that the production will be in the neighbourhood of about 2 lakh tons.

Orange plantations are found scattered all over the province but over 80 per cent of the acreage lies in the Nagpur district and neighbourhood. There are two crops of oranges, the winter crop and the summer crop but there is usually a continuous supply of oranges from about the middle of September to the end of May.

About 35 per cent of the production is consumed locally and the rest exported. Practically the entire produce is at present sold for consumption as fresh fruit and very little is used for the preparation of fruit products. It would thus appear that the orange growers are to a very large extent dependent upon outside markets for the disposal of their fruit. In recent years the tendency has been for this market to contract rather than to expand. The Nagpur orange plant has now been introduced into most parts of India, and large orange orchards have sprung up in Khandesh, the Punjab and Bihar. The Bombay market which was one of the important importers of the Nagpur orange has now been captured almost entirely by Khandesh. It is apprehended that when the whole of the Central Provinces area under orange comes into full bearing, considerable difficulty will be experienced in disposing of the fruit, unless other uses are developed by then. Even at the present time, in years of good crop and during the months of peak production, prices drop to such an extent as to become unremunerative.

The present methods of picking, packing and transport leave much to be desired. They result in considerable damage to the external surface of the fruit thereby reducing its keeping quality. The conditions under which the fruit is handled in the wholesale markets at Nagpur and other places are also unsatisfactory. The Nagpur orange market which was established about forty years ago, when the area under orange was only about a thousand acres, is now unable to accommodate the immense quantity of fruit that flows into it every

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\*Article on "Marketing of Nagpur Oranges" by Mr. P. D. Nair, in *Agriculture and Live stock in India*, Volume II, 1932, page 589.

day during the season. The market is not "regulated" with the result that a few merchants, who combine the functions of financiers, brokers, purchasers and exporters, form a ring and exploit the sellers with impunity.

The present methods of transporting the fruit to distant markets are primitive in the extreme. The fruit is generally packed in baskets made of bamboo strips which afford so little protection to the fruit that a large proportion, ranging from 20 to 30 per cent\* of the fruit, is damaged by the time it reaches the destination. The damage is much more, as much as 40 to 60 per cent, when the fruit, owing to shortage of packing material, is sent loose in ordinary wagons as though it were coal or stone. During the months of March, April and May, the arrivals in the Nagpur Orange Market alone range from 1,000 to 1,500 carts a day. A similar quantity also reaches other important rail head markets. The merchants and the railways are at present unequal to the task of handling these large arrivals efficiently. It may be estimated that out of the total exports about one-fourth to one-third is badly damaged during transport. It is clear that the financial loss involved is great, quite apart from the fact that a very large quantity of valuable and nutritious fruit is wasted in a country where large numbers of people are chronically undernourished.

The orange industry of Nagpur is of more than provincial interest. It is a fruit of great nutritive value and during the hot summer months of April and May the Nagpur orange is the only fruit that is available in any considerable quantity in India. It is therefore a matter of importance to the country generally that the production of the Nagpur orange should be put on a rational basis.

Recommendations.—The steps necessary to put the industry on a satisfactory basis are—

- (1) The improvement of the fruit by improving the plant by bud selection, by the establishment of standard nurseries, the production of disease-and-pest-resistant varieties, etc.,
- (2) the development of industries connected with the preservation of the fruit and the manufacture of its various by-products,
- (3) the improvement of marketing conditions, and
- (4) the improvement of transport facilities.

**114. Citrus Research Institute.**—For the purpose of achieving the aims outlined in (1) and (2) we recommend the establishment of a fully-equipped *citrus fruit research institute* at Nagpur. This institute will have two sections, (i) an agricultural and (ii) an industrial. The agricultural section will be under a horticulturist qualified to undertake work on the improvement of the plant by better methods of propagation, bud-selection, the establishment of standard nurseries, the propagation of disease-and-pest-free varieties and the selection of higher yielding varieties.

The industrial section which will be under a suitably qualified chemist will have two lines of work, one dealing with the preservation of the fruit and the other with the preparation of various by-products. This section will study problems connected with the preservation of the fruit, such as canning, preparation and preservation of juices, squashes, etc., marmalades, jams, candied peels, and other confectionery. The methods at present in use are crude. There is also great

\*Article on Marketing of Nagpur Oranges, by Mr. P. D. Nair in *Agriculture and Livestock in India*, Volume II, 1932, page 589.



need for standardising the processes and eliminating waste. It is also possible to extract from the orange valuable by-products such as essential oil, pectin and vinegar. Apart from conducting research on all these and similar problems, the research institute should also run small pilot plants on commercial lines for demonstrating the profitability of the business.

On the horticultural side, some work has recently been started under the auspices of the Imperial Council of Agricultural Research. Here again the scale of work is not commensurate with the magnitude of the problems involved, nor with the place of orange in the fruit economy of the province and it may be many decades before anything important is achieved. Practically nothing has so far been done on the industrial aspects of the problem. If research work on the lines referred to above is successfully carried out, and if the methods evolved are employed on a commercial basis it is expected, that a number of processing factories will be established which will absorb a large part of the present surplus production of fruit, with beneficial results all round.

It is also necessary to give facilities for promising youngmen to get training in fruit culture and preservation in America and England, and scholarship should be freely awarded to deserving men, see Chapter XVII.

For the improvement of marketing conditions the question of establishing an up-to-date fruit market in Nagpur with a railway siding in a less congested locality should be taken up immediately. From all points of view the present market is unsuitable. The new market should be laid out with roads and covered platforms, for exposing the fruit, with sufficient space for grading and packing and for storing crates of fruit awaiting despatch. The market should also be provided with cold storage facilities so that the period of distribution and consumption of the fruit may be extended.

**115. Railway transport.**—In regard to the improvement of transport facilities for oranges, the immediate problem relates to railway transport. This traffic at present yields to the railways over Rs. 20 lakhs as revenue every season and is probably the heaviest yielded by any one kind of fruit anywhere in India. Orange is a delicate fruit which has to be handled carefully for obtaining a reasonable price in the consuming market and transport conditions should be such that neither their condition nor their appearance would be affected. The present mode of transport in iron wagons damages the quality in both ways. It is, therefore, suggested that suitable types of wagons should be provided for this fruit, cold storage vans for long-distance transport and insulated vans provided with ventilators for short-distances. All wagons utilised for this traffic should be provided with shelves for arranging baskets thus preventing damage to the fruit in the lower layers which occurs at present when baskets are piled one on top of the other within the wagon.

It is also necessary to reduce the duration of transport. Wagons loaded with oranges are at present moved either by passenger or by goods train, usually by the latter as passenger freight rates are heavy. In either case, wagons have to wait at junctions for connecting trains and it is not uncommon that fruits are received at the destination in an unsaleable condition resulting in heavy losses. The question of running special trains for oranges connecting important consuming centres with the markets at regular intervals giving efficient and quick service should be taken up by the railways. Adequate facilities for

loading at the forwarding stations, such as covered platforms, should be provided; the present procedure of loading from rail level in the open damages the fruit, especially in the summer months.

Another important problem for the trade which needs immediate attention is the design of a suitable standard collapsible returnable container. The possibility of using local varieties of timber for this purpose needs careful and immediate consideration. An alternative solution may be the use of waste wood, such as the outer slabs of wood from saw mills, for making cheap non-returnable crates. In designing such containers, it is essential that their size should be fixed with a view to making the most economical use of wagon space and of providing suitable units for sale in the destination markets.

**116. Forest Industries—Forest Department.**—We have already mentioned that nearly half the total area of the province is under forest; of this again roughly one-half is Government forest and the other half belongs to private individuals, zamindars, malguzars and others. The Central Provinces has in its forests a potential source of vast wealth; they already yield a big revenue, bigger than almost any other province of India; but the department which is in charge of conserving and exploiting this great source of wealth is handicapped for want of a sufficient number of officers. The forest divisions in this province are the largest in India and their very size militates against the intensive working and close supervision by the officer in charge necessitated by modern working. So far Government has failed to produce a substitute for the Imperial Forest Service which is rapidly dying out (the youngest officer being 37 years old) and the Provincial Forest Service to which there was no recruitment for fourteen years. Two other points call for notice in the organisation and working of the Forest Department: (1) a tendency to judge an officer's work by the amount of revenue he produces and (2) the almost entire absence of any attempt to explore the industrial possibilities of forest products. There is indeed a Utilisation Officer, but his duties are almost entirely concerned with the sale of forest produce "untouched by hand". We do not of course ignore the large development of the saw mill industry that has taken place recently but this is entirely a war measure. We are of opinion that the policy should be altered and it should be made part of the duties of the Forest Department to explore and demonstrate the industrial possibilities of forest products to the extent of setting up pilot plants, where necessary, such as seasoning and preservation of timber by chemical treatment, wood distillation, manufacture of bobbins, plywood, extraction of tannin, utilisation of gums, distillation of essential oils, etc., etc. It is astonishing that even good wooden handles of agricultural implements, such as pickaxes, spades, hoes, hammers, etc., have to come from Europe and America, which is a sad commentary on our enterprise. This is a matter for the Utilisation Branch of the Forest Department. In order to facilitate this work we have suggested that the Utilisation Branch of the Forest Department should have a section in the Industrial Institute proposed in Chapter XI, where it will carry on experiments and research.

**117. Private forests.**—Private forests are generally mismanaged and their exploitation leaves a great deal to be desired. In particular since the outbreak of the war, reckless felling with a view to making money quick has been indulged in to such an extent as almost to endanger the very existence of this fine property. We consider that, in the larger interests of the province, Government should take immediate steps to see that this damage is repaired and that in future

exploitation is carried on with strict regard to the public interest. The Provincial Government should pass the necessary legislation without delay taking power to regulate and control private forests through the agency of the Forest Department. We are not unaware that the Provincial Government has recently amended section 202 of the Central Provinces Land Revenue Act but we are of opinion that this by itself will not solve the problem.

**118. Preservation of Mahua and Harra—(a) Mahua.**—The Mahua, *Madhuca latifolia*, is a forest tree, but the trees which grow in a close canopied forest bear very few flowers and little fruit. When the forests were felled for the extension of cultivation, the mahua trees were spared on account of their value as providers of food to man and beast, and they now stand alone with good round flower-and-fruit-bearing crowns in areas of cultivation and the more open grazing lands of villages in many districts. The flowers still form a very important article of diet of the people, particularly the poorer classes and the aboriginals. The flower also has considerable industrial importance for the manufacture of alcohol and alcoholic drinks. The fruit has always been known as yielding a valuable oil which is of great industrial value. It is noteworthy that while many plant the mango in the villages, no one takes the trouble to plant the mahua tree. In course of time the existing trees in the villages must inevitably die of old age, and as there is no natural regeneration outside Government forests, the valuable flower-and-fruit-bearing trees must inevitably disappear. As no one else appears willing to take action Government must, and either make the malguzars and tenants plant trees and see that they are properly tended for the first few years, or must take direct action itself. Legislation will be necessary to enforce this and must be undertaken. First, action should be taken by the Revenue Department, but when a fully organised branch of the Forest Department is sanctioned to manage the private forests, it should be considered whether this important duty should not be handed over to that department.

The Forest Department should be instructed not to eradicate this tree from the Reserve Forest.

**(b) Harra (*Myrobalans*).**—The myrobalan is the fruit of the harra tree, *Terminalia chebula*, which grows wild in many districts of the province. The fruit is one of the finest and most prized of all the tanning materials. It is exported all over the world and Jubbulpore no. 1, and Jubbulpore no. 2 are grades well-known in western countries. Not that Jubbulpore district is itself a greater producer of myrobalans than other districts, but Jubbulpore is the town in which the main collecting agency works. Harra is a tree of the forest but in the close canopied forests which grow timber the tree produces a thin crown and little fruit. In the village, and notably ryotwari village, areas of Mandla, Balaghat, the Melghat, Betul and many other districts on a smaller scale, the harra trees have been left standing while the grazing areas have been felled for nistar, so that they have developed the round crowns which are essential to good seed production; some trees have likewise been retained in the fields. The life-time of each tree is limited, and as no natural or artificial regeneration takes place in these cultivated or heavily grazed areas, it is only a matter of time for all these valuable trees to die off, and the country loses an important natural produce.

It is quite clear that steps must be taken that the trees are regularly replaced in the areas where they grow naturally, and particularly in the village grazing grounds. They will have to be grown under

orchard conditions as mango groves are so frequently produced. Government should, we consider, examine the question first and nominate the agency, preferably the Revenue Department, which will be responsible for seeing that the work is properly carried out.

119. The industries dealt with in this section are--

- (1) paper manufacture and printing industry,
- (2) plywood,
- (3) bobbins,
- (4) russa oil,
- (5) wood distillation, and
- (6) lac and shellac.

Paper—Present position.—There are no paper mills in this province.

Raw materials.—Various raw materials are used for the manufacture of paper but most of the paper made in India is based on bamboo. This province is particularly well placed both with regard to bamboo and the other important requirement, coal, and from time to time industrialists have been attracted by our resources and have made enquiries regarding the possible establishment of paper manufacturing units in the province but it is to be feared they received little encouragement. In fact they were told by Government on the advice of the Forest Department to drop the question for the present. Meanwhile, a mill has been established across our southern border in Hyderabad State and another across our eastern border in Orissa. The main raw materials required per ton of finished paper may be taken at about 2½ tons of air-dry bamboo and about 5 tons of coal. Other raw materials will, of course, vary with the process adopted but for the purposes of our estimate may be taken to include 5 cwts. of burnt lime and 2 cwts. of salt cake and 1½ cwts. of caustic soda. An examination of the raw material position made by one of our members, Mr. C. M. Harlow, till recently Chief Conservator of Forests, Central Provinces and Berar, has brought out the claims of at least 3 centres for the establishment of this industry, one near about Ballarshah in the Chanda district, another in the Dhodramohar-Barbatpur area of the Betul district and a third in the Lamta area on the Wainganga in the Balaghat district. He estimates that sufficient bamboo will be available in the first two centres for the manufacture of up to 100 tons of finished paper a day and a lesser quantity in Balaghat district and that this bamboo would be available within a 30-mile range. The cost of air-dry bamboo including a fair royalty will not exceed Rs. 16 delivered at any of these centres. The estimate is made on pre-war costs but there is no doubt that the supply position is most favourable. Other mills in India have to get their raw materials from places hundreds of miles away. The Mills at Brijrajnagar in the Sambalpur district, one of the most favourably situated mills, have now come as far down as Dongargarh for their bamboo supply.

Markets.—The all-India paper import figures include varieties of paper like newsprint which have not so far been manufactured in India. In 1938-39 the eleven mills then working in the country produced about 59 thousand tons\* of paper and we had then become self-sufficient for ordinary writing and printing papers. Now 17 mills are

producing (in 1941-42) about 94 thousand tons\* of paper largely of the same category. The paper demand grows apace, controls have had to be brought in and civilian consumption heavily restricted. This no doubt is largely the result of war conditions but even after the war the demand is not likely to abate a great deal. Even after the cessation of hostilities, work commenced in connection with the war will continue for a few years. Demobilisation and disposals will take time. Many war-time Government departments like Food, Supply, etc., will continue for some years; there is moreover a very large programme of reconstruction, particularly in the educational sphere, before the country. The probability therefore is that the demand for paper will increase, not decrease.

When all these factors are considered, an estimated increase in the all-India capacity by 50 per cent or, say, by 50,000 tons a year, in the class of paper at present manufactured in the country, as an immediate post-war measure, seems justified. It is submitted that as this province has centres with both bamboo and coal in close proximity to each other, such as few others have, the bulk of the increased demand should be planned on our resources.

**120. Recommendations.**—(1) We recommend the establishment of a 40 ton-a-day factory near Ballarshah on the banks of the Wardha river. The factory will draw its supply of bamboo from the surrounding forests and the coal from the nearby collieries. Good quality limestone is also available in the district. As stated in Chapter X, the factory must have an associated caustic soda industry working side by side. The output suggested is 10 tons of caustic soda a day out of which 3 tons will be used as liquid caustic in the paper mill. The chlorine obtained in the process will be used partly for bleaching the pulp and partly sold as bleaching powder or as liquid chlorine. Many of these processes will require large quantities of process steam and the power generation is best undertaken in the factory by employing extraction turbines. It may be an advantage to link up the factory power station to the southern grid, so that back pressure turbines can be employed and surplus and standby power requirements obtained from the public supply system.

(2) We recommend another 40 ton-a-day factory being built on the banks of the Tawa river in the Dhodramohar-Barbatpur area, not far from a made road. We have suggested elsewhere that the possibility of opening the Patakheda colliery should be examined with a view to locating the power station proposed for the Pench Valley coalfield public supply near this colliery. The paper mill project should also be considered with this scheme. It will no doubt require an extraction turbine, but with an ordinary condensing unit as standby the requirements of the public supply can be met even if the paper mill is stopped for any reason. If coal cannot be had from Patakheda, it can be obtained by rail from Hirdagarh about 80 miles away.

(3) We recommend a third factory of 20 to 30 tons a day to begin with in the Balaghat district. It will be situated on the banks of the Wainganga between Balaghat and Lamta. The factory will have to get its coal from the Pench Valley about 150 miles away. The industry should be promoted by private enterprise but production will have to be controlled and will have to be considered on an all-India basis, so that there may be no over-production and unhealthy internal competition. Such control will naturally consider the question of the varieties of paper to be made by the different mills and

any technical help required by the mills to embark on new lines such as kraft and wrapping papers should be given by a central agency like the Forest Research Institute at Dehra Dun. The Provincial Government will no doubt give concessional terms for the supply of bamboo and generous terms for power supply as recommended by us elsewhere.

**121. Printing industry.**—The printing trade in the Central Provinces and Berar is on quite a small scale, the only establishments, worthy of the name “printing press” being the Government Press, the Shivraj Litho Works, Nagpur, and a few private presses in Nagpur and elsewhere. The others are quite small establishments with no real craftsmen and seldom any power operated machinery. At the moment perhaps the needs of the province are met, but with the general expansion of trade and education, expected in the immediate post-war period, there is a definite scope for the establishment of three or four moderate sized and properly equipped presses in the province.

**Materials.**—The principal materials required by the printing trade are dealt with in turn below.

**Paper.**—We have already dealt with it.

**Type.**—One or two small type foundries exist in this province, but they produce only a few classes of type. The needs of the province in the immediate future are likely to be small and during the next few years it must depend mainly on type produced elsewhere in India. The existing foundries may however gradually develop.

**Machinery.**—Much of the printing press machinery is highly complicated and the erection of a factory for producing it must be considered on an all-India basis.

**Other materials.**—These are mainly ink, roller composition, binding material and glue. The needs of the province are yet small and it must as yet depend mainly on materials produced elsewhere in India, but any factory proposing to produce such materials should be encouraged.

**Personnel.**—One of the greatest handicaps of the trade is the absence of any facilities for technical training within this province. The class of workman, both supervisory and craftsman, is therefore poor. It is considered that such training should be an integral part of the proposed Polytechnic in which there should be a class for producing at least five or six students annually, who will be minor executives. In the more important junior trade schools there should be classes to produce annually some seven to eight each of compositors, machine minders and binders. It is only then that a proper apprentice system can work.

**122. Plywood.**—No plywood is manufactured in this province. The raw materials required for the manufacture are timber and glue or cement. Theoretically any timber that will peel on a rotary lathe can be made into plywood. In practice the choice is limited to a few species of which large quantities are available in straight lengths and of sufficient girth. The following timbers from the Central Provinces have been tried out at Dehra Dun and the results are as follows :—

- (1) *Haldu (Adina cordifolia)*.—It can be peeled and made into commercial grades of plywood, but veneers are likely to split and crack badly during seasoning.

- (2) Dhaora (*Anogeissus latifolia*).—It makes up into an excellent, strong, tough, durable plywood. Its weight is against its use as a general purposes plywood. Veneers are extremely liable to crack and split during seasoning.
- (3) Semal (*Bombay malabaricum*).—The plywood of this species can be utilised for light containers, packing cases and possibly also for tea-chests, one of the species in common use for plywood manufacture in the country.
- (4) Salai (*Boswellia serrata*).—Suitable for the manufacture of second grade plywood for general utility and tea-chest work. Heart-wood difficult to peel on account of brittleness of wood. Sapwood liable to insect and fungus attack. Requires rapid drying after peeling.
- (5) Shisham (*Dalbergia latifolia*).—Plywood extremely handsome, strong and durable.
- (6) Jamun (*Eugenia jambolana*).—Very suitable for making into plywood for general utility purposes.
- (7) Bahera (*Terminalia belerica*).—It makes up into good quality plywood, if the veneers and finished plywood are quickly dried. Suitable for general work and tea-chests. Extremely liable to borer attack, while in the log.

The glue used for binding veneers into plywood generally is casein cement, the principal ingredients of which are casein made from skimmed milk, hydrated lime and water. Recently many makers have taken to vegetable proteins, notably like that made from ground-nut cake. Either of these raw materials will be available here although eventually they may become replaced by synthetic plastics which produce high quality water-proof plywood for aircraft and marine purposes.

Indian imports of plywood into this country has been estimated to be of the value of Rs. 80.92 lakhs in tea-chests and Rs. 12.42 lakhs in boards in 1938-39.\* Since then however a number of plywood factories have been established in India. From three or four factories operating before the war, the number has now come to well over forty but there are no details of the present production capacity. So far as this province is concerned, the question of large scale manufacture will be decided by the availability of suitable species of logs of the required girth. The trees in the forests of the province are generally small. A small factory will be justified at Ballarshah but details will have to be worked out.

The manufacture of small size plywood for chests and furniture by the small scale industry using better class timber also is worth investigation and this can be undertaken by the Industrial Institute proposed in Chapter XI along with possibilities of manufacturing lamin-boards.

Bobbins.—Although we have undoubted resources in timber suitable for various purposes, our expanding textile industry depends largely on imports for supply of bobbins. The value of imports into India in 1937-38 was Rs. 44 lakhs. During this war, many concerns including two or three in this province, have started manufacture of bobbins. The product has not come up to the standard of the imported quality. The main defect is that the wood is not seasoned before use. Accuracy of machining is also important and even if it is secured any warping that takes place subsequently cannot be rectified. The subject is one in which some pioneering work has

\* Accounts relating to the Sea-borne Trade and Navigation of British India for March 1939, pages 117 and 152.

to be done by the Industries Department in consultation with the Forest Research Institute, Dehra Dun.

**123. Rusa grass and rusa oil.**—There are two varieties of the grass which are indistinguishable botanically and are known as '*motia*' and '*sofia*'. The valuable constituent is geraniol, and *motia* oil is more valuable because of its 90 per cent geraniol oil content against 40 per cent of *sofia*. People accustomed to deal with the grass can quickly learn to distinguish the two varieties by smell and by general form. The oil is obtained from the grass by boiling with water in a 'degh' and leading the steam and oil through a bamboo pipe into a vessel immersed in the running water of a stream. The apparatus is exactly that used in illicit distillation. The method is crude and the resulting oil is also crude, because it not only contains impurities but is also liable to char. The outturn is also less than by steam distillation.

Rusa grass occurs almost everywhere in the Central Provinces and Berar forest areas in huge quantities, but it is mostly *sofia* variety, which up to now has proved quite useless for the trade. *Sofia* must not be ruled out entirely from consideration as its oil contains 40 per cent of the valuable constituent geraniol, which modern methods or research may enable us to recover.

*Motia* occurs also in many parts of the Central Provinces but only occasionally. It occurs more commonly throughout Berar but particularly in the Melghat hills and in the neighbouring Central Provinces districts of Betul and Nimar. Ellichpur and Burhanpur have always been the local market centres of the trade. The *motia* area also extends into Bombay presidency, Central India and some states, but there is no doubt that we have the best areas in this province. Our best areas are along the high hills fronting the Berar plain. The annual outturn some time ago was estimated at about 150,000 lbs. more or less for all India. Most of it used to be exported by the Volkart Brothers and Messrs. Bauer and Krause, both of Bombay. It appears reasonable to state that over half the oil originated in this province. During 1900—1913 exports varied from 23,000 to 163,000 lbs. so that the figure of 150,000 lbs. is not too high.

The highest content of oil is in the flowers and seed. It follows therefore that the grass must be collected and distilled before a large proportion of the oil is lost by evaporation, and this must be in September-October. Now the *motia* variety seems to choose highly inaccessible spots in which to grow, and it is also to be noted that if the flowers are collected annually and completely, the grass never has a chance to seed, and must consequently disappear in time. Forest officers have reported this again and again, but unfortunately no action has been taken.

There is no doubt that the industry has a future in India and it is not difficult to see what is required. The one thing that is not required is examination of the method of extracting the oil; that is a simple process to the industrial chemist. Some experiments might however be made on the extraction of geraniol from the *sofia* variety. The points needing examination are as follows:—

- (i) A survey of the areas where the *motia* grass is found in reasonable quantity. This should not take long as the information will be found in forest offices or can be collected from enquiries among the forest staff. The value of the annual leases will give a sure indication of the best localities.



- (ii) Systematic propagation of the *motia* grass, and a systematic botanical investigation of the two varieties. We do not even know whether they are true to seed or whether the varieties are due to locality or some other factor.
- (iii) Some organisation of the distillation.

The work ought to be entrusted to an economic botanist because the cultivation and botanical work are far and away the most important part of the work necessary. Anyone could do the survey or the organisation of the distillation. The difficulty is that the work would be seasonal and the officer would have plenty of work at the sowing and harvesting periods and nothing to do during the rest of the year. It is clear that the work must be combined with something else. The only suggestion that can be made is to appoint an economic botanist to the Forest Department. It is commonly believed that our forests are full of hidden wealth, particularly in the shape of pharmaceutical drugs and similar products; and that a proper investigation will yield knowledge of value. This botanist would work on *rusa* during the important periods of the year, and for the rest of his time would undertake a general economic botanical survey. We feel sure that the *rusa* industry alone is of sufficient importance to pay for this.

The last point is organisation of the distillation. We have a highly volatile product, available for a few weeks only in the year and in most inaccessible places, and it must be distilled quickly. A moderately expensive plant is required which would lie idle for the rest of the year. One obvious suggestion is that the grass should be transported to some central locality, but it has to be remembered that the grass is in inaccessible areas with poor roads, that the oil is volatile and much of the grass flower would be lost by breakage. As the known main grass areas lie along the high hills fronting the Berar plain and beyond from Jalgaon (Buldana) to near Morsi, it should be considered whether we could make use of the boilers in ginning factories below the hills, but it may be that even they will be found too far away from the grass areas. The problem requires further study.

**124. Wood distillation.**—Destructive distillation of wood consists in heating wood out of contact with air, in a closed retort provided with outlets through which the volatile and liquid products escape. Here we deal with the distillation of hardwoods, as we produce no softwoods:

"In modern practice the carbonizing vessel for hardwoods is generally a cylindrical wrought-iron retort built into brickwork in a horizontal position. This retort is heated by a fire below, but the naked flame is not allowed to impinge directly on the retort, which is heated only by the hot furnace gases, this result being obtained by utilizing iron or brick shields or arches. The batteries of retorts are set up in rows and the outlet pipe of each retort is connected with a worm condenser made of copper and cooled externally by means of running water.

"On the application of heat to the retort, the substance of the wood is charred, which results in volatile products being driven off. Those which are condensable are liquefied again in the condenser and are collected in suitable receivers."\*

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\*Manual of Indian Forest Utilisation, by H. Trotter, I.F.S., 1940, page 259.

This is the general principle of wood distillation, but a fuller description of the process employed at the wood distillation works at Bhadravati in Mysore State is given in Trotter's *Manual of Indian Forest Utilization*, page 259 *et seq.* Trotter concludes by saying that wood distillation is not a profitable proposition in India when he wrote, largely because of the difficulty of marketing charcoal and the by-products and of the large destruction of forests which distillation involves. But he added: "It is possible, however, that a recent development in the wood distillation industry, namely, the direct conversion of the pyroligneous liquor into acetic acid *without going through the intermediate stage of lime acetate*, may make a considerable difference to the industry:

"This new process was discovered by Suida, an Austrian professor, and his process is now being worked by two small plants in France and Yugoslavia, and an American plant is also trying it on a factory scale. If the process proves successful, it will greatly reduce the cost of manufacture of acetic acid, which is used in large quantities in Ceylon, Java, and the Malay States, in the rubber industry. It is still possible, therefore, that India may find it profitable to manufacture acetic acid for these countries, which are much nearer to her shores than those of Europe and America."\*

Since Trotter wrote the above, conditions have improved so far as the economics of the industry are concerned—

(1) All the charcoal produced can be readily sold in Bombay and Delhi at a handsome price. This is not merely a war-time demand, as it is likely that charcoal will continue to be in demand and to fetch a good price even after the war. A condition precedent, however, is that the existing indiscriminate manufacture of charcoal by all and sundry which goes on in the forests, both Government and private, at present, should be prohibited. Local demand will also increase as a great deal of charcoal will be used in the province itself in its producer gas plants.

(2) All the by-products can be fully utilised in the country in the industries that have been, or are likely to be, started in the post-war period.

Large quantities of acetic acid will be absorbed in the textile and rubber industries and in the manufacture of cellulose lacquers and artificial silk and in medicine as acetic ether, acetone, iodoform, chloroform, etc. Wood alcohol will be required in varnish industries as formaldehyde. The latter in itself is a useful preservative and is also used for making a plastic glue for cementing peeled veneer in the plywood manufacture. Wood tar can be utilised for asphaltting roads and as a preservative for the large quantities of poles that will be needed for transmitting power from the proposed thermal stations.

The only objection that then remains to starting wood distillation will be that firewood is readily saleable as such, but it is forgotten that the local consumption of firewood is very small compared to the quantities burnt to make charcoal for export purposes, and the export of firewood over long distances is not practicable.

Several sites suitable for wood distillation can be found in the province, *e.g.*, the Betul forests appear to be pre-eminently suited for

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\**Manual of Indian Forest Utilization*, by H. Trotter, I.F.S., 1940, page 263.

it, being situated in the heart of the province, an undeveloped area with little local demand for firewood and favourably situated for exporting charcoal. Bhaora (Dhodramohar) on the Tawa will be a possible site. A sustained supply of roughly 100 tons of wood a day could be obtained and the cost of transport could be reduced by constructing suitable roads and using producer gas vehicles for transport. Lime is available nearby. The daily outturn will be: charcoal 30 tons, calcium acetate 30 tons, wood tar 500 gallons, alcohol 300 gallons.

We understand that some influential business interests are likely to start wood distillation on a commercial scale very soon in the province, in which case it will not be necessary for Government itself to start even a pilot plant. All that would be needed is to render such assistance, technical and other, as may be required by this company. We recommend that all such facilities may be given to help it to establish the industry.

**125. Lac and Shellac.**—Lac is the raw product and shellac is the manufactured article of which India has a virtual monopoly. It has a multiplicity of uses in a great many trades but the most important are the gramophone record industry and the electrical trade. Its main virtues are that it is the hardest known natural gum and it has a high electrical resistance. The chief deficiency is that shellac is manufactured principally by cottage and very small scale industry; it is usually subject to adulteration and there is no standardisation. Chemists have been searching for a substitute for years and have found substitutes for certain uses, but have so far not succeeded in finding one article to replace shellac in all its uses. The trades using shellac are expanding trades and therefore the shellac trade has not yet seriously felt the competition of the synthetics, but there seems no doubt that unless the shellac trade is re-organised and its products standardised the time is bound to come when an efficient product will be synthesised, at a competitive cost. India will then lose a very valuable industry.

Lac is an exudation from an insect living on the twigs of certain trees. It grows wild, but the production would be small if left to itself so that it is always cultivated on these trees. As its cultivation involves the taking of life, the business is chiefly in the hands of low caste Hindus, aboriginals and Musalmans. Bihar produces most of the lac of India but the Central Provinces has a substantial share, chiefly from localities centering round Gondia, Katni, Dhamtari and Pendra. Small quantities however come from most districts, except in the extreme west. In the Central Provinces it grows on palas (*Butea frondosa*) particularly, but small quantities are produced from kusum, ber and ghont. Trees growing in close canopy are not suitable for the growth of lac, so that cultivation in Government forest is small and the bulk of it is produced on palas trees growing in open village lands. Cultivation is bad, quite unorganised and haphazard. Lac is subject to serious degrade unless properly and scientifically stored, and therefore such degrade is usual. This degrade and subsequent adulteration throughout its progress from the cultivator to the manufacturer are the chief problems of the trade. From the cultivator to the shipper it passes through something like twenty hands so that the trade is a highly complicated one.

The Government of India realised the importance of this trade during the 1914—18 war, and an enquiry was immediately held. As a

direct result of this, the Lac Research Institute at Ranchi was organised to deal with the problems of the trade. This institute has done excellent work on all aspects of the trade, but it has failed entirely to get its results across to the cultivator. Unless this is done, all the work is fruitless. Many attempts have been made to get the Provincial Government to take up the problem and the Provincial Government has sought the advice of its Agriculture and Forest Departments. Neither department is organised for such work; the Agriculture Department always informs the Government that lac grows on trees and it is therefore the work of the Forest Department; the Forest Department reports that it mostly grows outside reserved forests and the department is quite unorganised to undertake such work. Both statements are of course quite true. The solution seems to be for Government to recognise that the lac trade is very important and that the way to deal with the problem is to teach the cultivator how to grow the lac properly and how to prepare it for the market; how to store it so that degrade is reduced, and how to market it so that he gets a fair return for his labour. The work is not pure agriculture and it is not pure forestry, but partakes of the characteristics of both, being work primarily for an entomologist. Our view is that a separate branch of the Forest Department should be organised for this purpose and placed under an entomologist who should be deputed for a course of training to the Lac Research Institute. He should then organise a staff which can be recruited from men with some knowledge of science, and can also in the first instance be trained at Ranchi. This organisation will then tackle the problem from the bottom by instructing the ignorant cultivator.

**126. Animal Products: Dairy Industry.**—Dairying is one of the most ancient cottage industries in India, the importance of which can be judged by the fact that the cattle population of India is about a third of that of the entire world and the value of hand-drawn milk was recently estimated at over Rs. 180 crores per annum. All the same, the industry is still practically as it was a thousand years ago, an unorganised cottage industry carried on by innumerable small producers, following primitive methods involving considerable waste.

According to the *Report on the Marketing of Milk in India*, recently issued by the Marketing Department of the Government of India, the Central Provinces and Berar has 32.2 lakh cows and 8.3 lakh she-buffaloes producing 24.36 lakh and 55.00 lakh maunds of milk respectively per annum. In Bihar, practically the same number of cows produces ten times more milk (248.48 lakh maunds), while in the Patiala State 2.1 lakh she-buffaloes produce 54.55 lakh maunds of milk annually. This very low productivity in the province is due to various causes. But the most important are, inadequate fodder and uncontrolled breeding. It is a matter of common knowledge that even the ordinary cow or buffalo, when fed and looked after properly, gives appreciable quantities of milk.

The policy in regard to dairying and cattle improvement has so far been haphazard and desultory. For a long time, the aim has been to improve the cattle and milk production by "grading", i.e., by the introduction of foreign blood. Experiments were tried by importing European and later Punjab bulls. This policy has failed, and the general effect has been that many of the local breeds of cattle, which were once famous, have become practically extinct on account of neglect. In spite of our ample forests and grazing lands, it is unsatisfactory to learn that the province is dependent upon outside sources for a large percentage of its cattle requirements.

In any attempt to improve the dairy industry, the first step is the improvement of the cattle breed. Systematic efforts should be made to develop the good indigenous breeds of cattle by the establishment of large breeding farms, separately for each breed at suitable centres, and further by enlisting and subsidising private effort in this direction. Live-stock Improvement Associations on the lines of the one recently established at Wardha, for the *gaolao* breed should be established for each important breed of cattle. The main objective of these organisations should be the production of large numbers of pure bred bulls for distribution. Male calves, not true to type and unsuitable for breeding purposes, should be castrated early. Compulsory castration should be introduced, if necessary.

**127. Importance of good fodder.**—A recent bulletin\* on the fodder and grazing position in the province points out that in regard to both roughage and concentrates, the total amount of cattle feed now available in the province is far short of the actual requirements. All the same, a very large percentage of the oil cake and cotton seed produced is exported, and enormous quantities of forest grass are allowed to go to waste. The possibilities of converting the forest grass, not easily accessible to grazing, into hay and silage, should engage the attention of the Forest Department. The supreme importance of devoting a certain percentage of cultivated land to fodder crops should be instilled into the minds of the cultivators, and Government should undertake the introduction and popularisation of fodder crops suitable for each tract.

An urgent need of the dairy industry is organisation. We commend the scheme for the improvement of ghee production recently started at Jhallar in the Betul district by the Veterinary Department, and suggest its adoption wherever possible. This will also help to save the enormous wastage in the industry by the utilisation of by-products such as skim-milk, which could be converted into milk powder, casein, etc. This will improve the present system of distribution and marketing to the advantage both of producer and consumer, and also help to increase the subsidiary income of the cultivators.

**128.** The milk supply in the urban areas of the province is at present in a very unsatisfactory condition both in regard to quality and quantity of milk supplied and the problem merits the serious consideration of Government. There is great scope for developing dairies round about the big cities and towns of the province for supplying pure milk at reasonable rates to the population. The Telankheri Dairy established by the Agriculture Department about 30 years ago offers a good model for urban milk supply and the aim should be to develop such dairies on modern lines all over the province. It is understood that proposals have been submitted by the Veterinary Department to Government for the establishment of 20 big dairy units in urban areas on co-operative lines as part of a co-ordinated scheme for the development of rural and urban milk supplies. The department has also prepared schemes for developing a number of ghee producing centres with a view to ensuring increased production of ghee and a more efficient system of collecting and distributing the products by eliminating middlemen as far as possible. We commend

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\*The Fodder and Grazing Position in the Province, by P. D. Nair and K. P. Sagreya, 1944.

to the earnest consideration of Government these proposals which, if given effect to, would go a long way towards putting the dairy industry of this province on an economic footing.

**129. Hides and Skins.**—Hides and skins are among the most important raw materials this province exports in large quantities as will be seen from the statement below :—

*Exports in Tons.*

Year		Raw Hides	Raw Skins	Total	Tanned
1937-38	..	1,907	1,606	3,513	204
1938-39	..	2,495	1,428	3,923	267
1939-40	..	3,031	1,468	4,499	260
1940-41	..	2,095	1,389	1,484	395
1941-42	..	2,089	1,492	3,581	252
1942-43	..	3,278	1,492	4,770	135

The exports are an instructive commentary on the tanning industry in the province. More than three-fourths of the hides produced are from dead and fallen animals. A number of these, however, are actually left to perish without any use being made of their carcasses and represents a large waste of resources. Such wastage cannot obviously be stopped unless it is made worth the while of owners to reclaim the carcasses by prospects of a good price for them. Such hides as are recovered suffer considerably from bad treatment. It has been estimated that the total loss due to defective flaying alone in all India is about Rs. 70 lakhs.\*

**130.** The village chamar is the primary producer of the majority of hides. He receives the carcass of the dead animal usually free of charge. His ways of dealing with it are extremely crude. Much loss in quality of otherwise good hides can be traced to his ignorance. Every careless mark, cut or scratch during the flaying operation causes monetary loss but the chamar is usually too ignorant to realise this. Besides such damage, the chamars generally leave too much flesh and tissue adhering to the pelt which render preservation difficult and the hide "gives way" in patches during the liming process at the tannery.

If the methods of flaying are unsatisfactory, the methods of curing are no better. Curing is done either by salting or by the sun-drying process, mostly by the latter process as salt is not readily obtainable in the village and is also costly. When salting is done, it is done in a haphazard manner. In sun-drying the hides are not stretched but merely spread on the ground or thrown on branches of trees for drying. The chamar sells the cured hide to the village merchant (beopari) who in turn sells it to the wholesale merchants in town for export. The beopari generally exploits the ignorance of export values of the chamar who is grateful for what

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\*Report on the Marketing of Hides in India and Burma, 1943, page 62.

little he gets and continues to be poor. He cannot do better work unless his position is improved. His position cannot be improved unless he gets a better price for his work and the vicious circle goes on. The solution is to organise the industry on co-operative lines as suggested elsewhere in this report. The chamar should not only be educated in proper flaying and curing methods but made to realise the advantages of careful working. It is only when a better product is made that the general price level will go up sufficiently to enable all the hides now left to perish being turned to account. The subject is one of extreme importance and Government should spare no efforts to improve the existing state of affairs.

Arrangements will have to be made for training chamars in improved methods of flaying and curing. Peripatetic parties, as described in Chapter IX, should be organised to tour the villages and train the chamars. The co-operative organisation will see that the chamar gets a fair price for his work. The supply of duty-free salt for curing should be arranged. Further all the products of dead animals should be utilised and collection and disposals made through the co-operative organisation. Lastly, there must be established a few tanneries working on efficient and up-to-date lines to deal with these hides and skins.

**131. Leather and Leather Goods.**—Production of leather in this province is by crude methods mainly as a cottage industry. There are also six small tanneries employing about 400 persons in all doing very inferior tanning.

**Raw materials.**—From the statement under hides and skins it will be seen that we export on an average about 3,500 tons of raw hides and skins every year from this province, while estimates based on our cattle population point to the availability of about 12,000 tons a year of hides and skins, if our resources are fully tapped. Large quantities of tan stuffs are exported from the province. In 1937, about 42,000 tons of *harra* (myrabolans) went out of the province. Other tanning materials like *babul* bark, *dhaora* leaves, etc., available in the forests are also exported in large quantities to Bombay and Calcutta. Thus the province has all the essential raw materials in abundance for the vegetable tanning industry. Chrome tanning is a useful adjunct and is also justified by our large resources in hides and skins.

**Recommendations.**—The establishment of three up-to-date modern tanneries in the province is proposed as an immediate post-war measure not only with a view to the replacement of some of the present exports of raw hides and skins by finished leather but also to improve the methods of production. The centres suggested are Nagpur, Jubbulpore and Raipur. The units proposed will do both vegetable and chrome tanning. Their capacity will be 200 hides per day each to start with in the vegetable section and 100 hides in the chrome section, but capable of later expansion to 500 and 300 a day, respectively. Attached to each tannery will be a shoe and chappel factory and a game and skin-curing section (taxidermy). The factories can also manufacture glues, tannin extracts, etc. The capital cost of plant, machinery and buildings of these factories may be about Rs. 6 lakhs each. But large sums will have to be locked up in raw materials and hides in the course of processing and a total investment of above Rs. 20 lakhs per factory inclusive of this working capital may be required.

**Markets.**—The market for finished leather in the province itself is not extensive. The statement below gives the import figures of both raw hides and finished leather into the province :—

*Imports in Tons.*

Year	Raw Hides	Raw Skins	Total	Tanned
1937-38	.. 161	246	407	124
1938-39	.. 153	169	322	121
1939-40	.. 187	257	444	137
1940-41	.. 108	236	344	151
1941-42	. 129	168	358	223
1942-43	.. 288	54	342	142

These figures, however, do not take account of imports of finished shoes and chappals. The three factories proposed together will have to find markets for about 1,200 tons of finished leather every year. In spite of our advantageous position with regard to raw materials, the marketing problem will offer many difficulties for the first few years, as we are late in entering the field. With large-scale expansion of output by well-established factories in the north and their search for markets for their surplus output in peacetime, severe internal competition should be expected. The industry will be able to withstand such competition, only if the enterprise is undertaken by concerns with adequate financial resources and experience of the trade. The Provincial Government should, in view of the vital importance of establishing such an industry, give it all possible assistance. These tanneries will also purchase the skins and hides produced by the co-operative organisation and the Government should have control over the industry as on it would depend, in some measure, the success of the Government drive to improve the methods of collection and curing of hides. It is recommended that Government should take 51 per cent of the shares of each tannery and obtain representation on the directorate.

**132. Bonemeal.**—Bonemeal having a large phosphorus content is a valuable manure. This province has a very large cattle population and the production of bones as well as of hides is enormous, so that a bone crushing plant is clearly indicated; in fact there should be a whole series of such plants throughout the province. There is no doubt that the crux of the problem is collection, as manufacture and distribution should present no difficulty whatever. In this connection it may be noted that the problem is identical with that in the hide industry, in which it seems to us that the main problem is to get the hides off the dead animals into the tannery, and in as good condition as possible. The problem of bone collection is really much simpler as the bones are not subject to the same deterioration as the hides. It seems therefore that bone collection should be organised as ancillary to hide collection, and it would seem logical to organise the bone crushing industry as a sideline of the tannery. At least three, but preferably more, bone crushing plants should be installed, say, in Nagpur, Jubbulpore, Raipur where the bonemeal after treatment with sulphuric acid will be distributed as superphosphate to be used along with ammonium sulphate.

The industry will be financed and managed by private enterprise but Government will give technical advice where necessary and guarantee to purchase the manure in view of its extreme importance to the agriculture of the province.



## CHAPTER IX.—SMALL SCALE AND COTTAGE INDUSTRIES

133. Small scale and cottage industries have always played a vital role in the economy of the country, not only because they provide employment to large sections of the people but also because they bring in additional income to those engaged in agriculture during the latter's enforced leisure of three to four months in the year. The national interest requires therefore that these industries should be wisely planned and given every support and encouragement.

It is sometimes considered that there is a conflict of interests between heavy industries and small scale and cottage industries. It seems to us that this is a profound error. In a vast country like India where poverty and unemployment exist on a colossal scale, these two types of industries have very definite roles to fill and are complementary to each other. In our view, only by the development of both or, to borrow the felicitous phrase of the Second Report, by marrying cottage production with organised industry\*, can we provide an adequate solution to the unemployment problem and help to raise the general standard of living.

The workers engaged in small scale and cottage industries live scattered over large areas. They are ignorant and illiterate; their methods of work and technique are crude; their capacity to absorb new ideas or to adopt new business methods is limited; their output is small. Being unorganised, they waste time, effort and money in obtaining raw materials and implements. Their marketing methods are primitive and they are easily exploited by middlemen. Often, a merchant finds the capital, in which case the artisan becomes little more than a labourer. In many cases they have to pay heavy taxes beyond their capacity; e.g., municipal taxes, or "nazarana" to malguzars, such as are paid by bricklayers, or Government taxes such as the salt tax paid by chamars.

The first important survey of small scale and cottage industries in this province was made in 1908 by Mr. (later Sir C. E.) Low, then Director of Agriculture. He suggested Government assistance being given to a number of such industries; but the action taken on his recommendations was inadequate.

The next important survey was made by the Provincial Banking Enquiry Committee in 1929-30. It observed† that the recommendations of the Indian Industrial Commission regarding provision of marketing facilities for the products of these industries had not been implemented and made a series of recommendations for their improvement; in particular, it recommended that the Department of Industries should be strengthened and required to collect statistical information and to organise marketing facilities, and that these industries should be organised on co-operative lines for the purposes of finance and marketing. Again very little was done.

A much more elaborate survey was conducted by the Industrial Survey Committee appointed by the Provincial Government in December 1938 with Mr. J. C. Kumarappa as Chairman. But the outbreak of the war and subsequent developments prevented full consideration being given to their report.

The war, in our opinion, provided a splendid opportunity for restoring much of the lost ground to small scale and cottage industries. But this opportunity has not been fully taken partly owing to the many pre-occupations of Government and partly owing to a lack

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\* *Second Report on Reconstruction Planning*, page 25.

† *Provincial Banking Committee's Report*, pages 237-238.

of proper appreciation of the importance of the problem. The favourable conditions created by the war are however likely to continue for some time to come and a vigorous and systematic drive for the rehabilitation of these industries would be of great public advantage.

**134. Present position\*.**—Spinning and weaving constitute the biggest group. In 1941 it was estimated that there were about 73,300 looms employing over 50,000 weavers in as many as 3,000 centres scattered all over the province. The available statistics show that in 1928-29, handlooms supplied nearly 28 per cent of the total cloth requirements of the province. The loom in use at present is an improvement over that used then and there are even some dobbies and Jacquard looms working in the bigger centres. In a few centres the weavers have taken to power looms for weaving some varieties of cloth. The number of power looms so used was estimated in 1944 at about 600.

Latterly, weavers all over the province have begun to organise themselves on co-operative lines. We are informed that these weavers' co-operatives are progressing on sound lines notwithstanding war-time restrictions, and are now doing business of over Rs. 2 lakhs per month.

Hand spinning centres are mainly to be found in the Chanda district. These centres are supervised by the Maharashtra Charkha Sangh, which is a branch of the All-India Spinners' Association. They provided employment to about 1,500 persons in 1930.

**135.** Among the more important of the remaining cottage industries are:—Carpentry; smithy; bamboo work; pottery, tiles and bricks; processing industries such as oil pressing and rice milling; tanning and leather work; bidi manufacture and lac industries. The first five of these provide essential services to the village communities and are to be found in almost all villages. The remaining three are important industries in themselves and provide employment respectively to about 100,000, 50,000 and 10,000 persons.

The tanning and leather industry is about the most inefficiently conducted industry in the province. This is due to the extreme poverty and social backwardness of the chamars and others engaged in it. The total number of hides available in the province is estimated approximately at 1,000,000. But there is a great deal of wastage during the flaying and other preliminary operations. The great bulk of the hides go out of the province in a half-tanned or raw condition and, as a consequence, very little of the benefit from the leather industry accrues to the province.

**136.** Of the lac industry, India has almost a monopoly. This province produces about 16 per cent of the total amount of lac in India. The average annual export from this province during the quinquennium 1937-38 to 1941-42 amounted to 8,978 tons. In addition to the traditional toy and bangle industry based on it, lac is used extensively in the manufacture of electrical goods, gramophone records and varnishes. For these latter industries, lac is almost irreplaceable as it possesses properties which are not all to be found in other synthetic or natural resins. The most important lac-producing areas are those around Gondia, Katni, Pendra and Dhamtari. There are about 25 shellac factories and of these 13 are in Gondia. The propagation of lac and the collection of the resin is in the hands of ignorant contractors and ignorant labourers. The industry suffers therefore not only from unscientific methods but also from reckless adulteration which, if not checked, may kill it.

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\*Statistics taken mainly from the *Provincial Banking Committee's Report*, Chapter IX. Some figures are from the *Report of the Industrial Survey Committee* appointed in 1938.

Both the leather and lac industries are of great importance and should be given high priority in any scheme of post-war planning. The Government Lac Research Institute at Ranchi has done much useful work on lac, but the small men engaged in the industry are incapable of utilising that knowledge. We have made recommendations elsewhere in regard to the future of the industry. (See Chapter VIII.)

**137. Recommendations—**(i) Co-operative industrial establishments.—The only effective solution for the problems of small scale and cottage industries is to organise them on co-operative lines to the maximum extent possible. This has been achieved by the Chinese Industrial Co-operatives in recent years.\* Denmark has shewn to the world how agriculture and dairy farming organised on co-operative lines can bring many advantages to the small producer. Russia† has demonstrated the speed with which the work of co-operative organisation could be done by increasing the number of members of her productive co-operative societies from 1.2 millions in October 1923 to 11.3 millions in April 1928. The peasant households brought within the Russian productive co-operative movement (as distinguished from the credit co-operative movement) by April 1, 1928, amounted to 42 per cent of the total number of peasant households in the entire U.S.S.R. Conditions in this province are not very different from those in China, or Russia at the time of the Revolution. There is no reason therefore why we should not be able to achieve similar results in the next five or ten years. It is true that in India, as in China, war conditions have created many difficulties in the way of co-operative development; but, war conditions have, on the other hand, offered excellent opportunities for building up a good co-operative organisation for agriculture as well as for the cotton industry. We learn that attempts made in this province in recent years to organise agriculturists and artisans on co-operative lines have met with considerable success but the Co-operative Department, as at present staffed, is unable to cope with the increasing demands from the people for assistance in the expansion of the movement. We understand that the volume of business of productive co-operative societies in the province increased from about Rs. 14 lakhs in 1942 to well over Rs. one crore in 1944 and that practically every month registers a new record in the total amount of business done. We feel that the opportunities offered by war conditions for strengthening the co-operative movement should be taken, thereby facilitating its post-war development.

Government should in our opinion actively take up the work of organising small scale and cottage industries on co-operative lines. We are not unmindful of the magnitude of either the effort or the expenditure involved. But we feel that the task has to be taken in hand, without loss of time, if the province is not to lag behind in the general march towards industrialisation. The training of the large body of workers required for this task is itself a big problem and it should be solved by starting immediately a training school for workers. The staffs of the Co-operative and Industries Departments should be increased to the extent necessary as early as possible.

In order that the opportunities offered by war conditions may be utilised adequately in developing industrial co-operatives, we suggest that co-operative societies which have proved their worth and competence should be recognised to the extent possible as Government's agencies for administering the manifold controls in force affecting the manufacture, supply and distribution of commodities.

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\*See *China Builds for Democracy* by Nym Wales.

†*Agricultural Co-operation in the Soviet Union*, by G. Rathner.

An idea of the type of organisation suitable for agricultural co-operative societies has been given in paragraph 3 of section 20 of the Second Report. A similar co-operative structure would appear to be suitable for industrial societies also. Ordinarily, the village society could be both an agricultural and industrial society. In addition, it can function as a co-operative store and also as a social and recreational centre, as has been suggested in the Second Report.\* Given the co-operative structure and a measure of guidance from the Co-operative and Industries Departments, the rehabilitation of small scale and cottage industries on sound and profitable lines should be assured within a reasonable period of time.

(ii) Training of village artisans.—At present village blacksmiths and carpenters cannot repair anything more complicated than village ploughs and bullock-carts. The methods employed by the village charmar in flaying and curing hides are primitive. We consider it necessary to train the former class of artisan in modern fitting and assembly practice, so that they can do minor repairs to complicated machines and implements such as gas plants, tractors and newly designed processing and other implements which will find more and more favour in the village and the latter in improved methods of tanning and leather work. This task, in our view, will have to be undertaken by Government as it is beyond the capacity of industrial co-operative societies. Village blacksmiths, carpenters and chamars should be induced to join training centres similar to those started for training fitters, mechanics and turners for war work. There should be such a centre at each district, and at the more important tahsil headquarters. The workshops attached to the junior technical schools recommended in Chapter XVII may be used for the purpose. The training should be of an intensive character as in the case of technicians trained for the war and may be of about six months' duration.

In addition to these training centres, it is suggested that fully equipped mobile training and demonstration units consisting of from three to four trained men, inclusive of the driver, should camp in important villages for as long as necessary and teach the village artisans not only improved methods of work in crafts like carpentry, smithy, tanning, leather work, etc., but also in the nation-building activities like the methods of conservation and utilisation of farmyard manure, making of silage, care of cattle, dairying, anti-malarial measures, public health, sanitation, etc. Each unit will have one fully equipped omnibus to carry the party, their kit and equipment. They will stay in the more important villages of the circle, say three or four, for as long as necessary, say from six weeks to two months at a time. All these instructors will be drawn from the ranks of war-technicians. We consider that there should be at least one such unit for every Revenue Inspector's circle and thus about 1,200 war-technicians will be absorbed. These men will have to have a thorough training of at least six months' duration. The detailed course and syllabus of instruction will have to be carefully planned in consultation with the departments concerned, i.e., Agriculture, Co-operative, Veterinary, Public Health, Education, Forests and Industries. Two or more temporary Rural Training Centres for training these instructors will have to be established and later a permanent centre may be run for a refresher course which they will attend in turn for periods of say two to three months. The first step will be to train about 100 teachers for training the staff. This should be taken up immediately and men from the various departments like Veterinary and Agriculture should be drafted for the purpose.

(iii) Industrial co-operative societies for *ex-service* men.—According to the figures supplied to us some 4,000 technicians, such as fitters, turners, machinists, etc., have been trained in the training centres in the province established in connection with the war. Some of them may return to their peace-time occupations and a selected number will be employed as teachers in the junior technical or trade schools, in the training institutions mentioned in the previous sub-paragraph and in the technical high schools referred to in Chapter XVII. But it is probable that a certain number will still be unprovided for. We suggest that they should be encouraged to form small co-operative industrial units of their own with the capital that they may have saved up during the war and with such assistance as Government may find it possible to give them. While disposing of military property such as stores, equipment, buildings, dairy farms, poultry farms, and the like, we consider that Government should bear in mind the requirements of industrial co-operative units to be formed by *ex-service* men. We do not suggest that these should consist exclusively of *ex-service* men; on the contrary we think that they should include others as well.

(iv) Industrial Institute and Workshop for designing new machines for use in cottage industries.—The need for an institution of this kind is, in our view, great. At present the work of designing such new machines is being done only to a very small extent in the laboratory of the Village Uplift Board and in the Maganwadi Workshop managed by the All-India Village Industries Association. We have recommended elsewhere that this work should be done on a large enough scale in the cottage industries section of the Industrial Institute, the establishment of which we have recommended in the chapter on Engineering Industries.

(v) Provision of technical advice to industrial co-operative societies.—Generally speaking, industrial co-operative societies will not be able to employ highly qualified technical men, nor will they be able always to get technical advice of a high order with their own resources. It is desirable therefore that Government should maintain a service of engineers whom such societies may consult on payment if necessary. We have included this item in our proposals for the re-organisation of the Industries Department.

(vi) Establishment of an Emporium.—We suggest that Government should start an emporium for exhibiting articles made in the province, in which special preference should be given to products of small scale and cottage industries, which require greater publicity than others. This emporium should form part of the Industrial Institute referred to above.

## CHAPTER X.—INDUSTRIAL CHEMICALS

138. Industrial Chemicals form a class of basic or key industries which are vital to the full-fledged development of the province, and should receive the very careful attention both of Government and public. The establishment and development on economic lines of the chemical industry is only possible if it is viewed as one group rather than as consisting of so many independent items, since they are so closely inter-linked with, and are interdependent upon, one another. The importance of this group of industries lies in the fact that the industrial use of the raw materials of the province depends upon the availability of these chemicals. As the Tariff Board on the Heavy Chemical Industry says: "One of the principal grounds on which the chemical industry may establish a claim to public assistance is that it is a key industry. Its products are used in most other industries, in the textile industry, the leather industry, the paper industry,

the glass and porcelain industry, the rubber industry, in the making of artificial silk, of paints and varnishes, soap and candles, and in the purification of mineral and vegetable oils. . . . If India is ever to become industrialised on any considerable scale, the establishment of the chemical industry on a firm basis is clearly a matter of great importance."\* They go on to remark: "There is another point of view which also makes the industry one of national importance. During the last few years industrial advancement as well as the development of agriculture has been largely a question of applied chemistry. In every country therefore today more and more attention is paid to chemical research both for industrial and for agricultural purposes. The real foundations of industrial chemical research can never be laid in any country which does not possess a chemical industry; for though much knowledge may be acquired in laboratories, unless that knowledge is applied in practice to the needs of industry and agriculture, little or no advance is possible. The vast mineral, forest and agricultural resources of India cannot be exploited to their fullest extent unless opportunities are given to chemists to acquire practical knowledge in works where the processes of manufacture are in actual operation."†

The industries considered in this Chapter comprise fertilisers, nitric acid, nitro-cellulose, sulphuric acid, soda ash, caustic soda, bleaching powder, chlorine, industrial solvents and coal distillation products.

**139. Present position.**—None of these industries are actually in existence to-day, but a ten-ton sulphuric acid plant at Kanhan and a smaller one at Katni, both employing the chamber process, are under erection. A small quantity of soda ash in crude form is being recovered from the Lonar Lake in Buldana district, and a small factory in Nagpur is manufacturing caustic soda from purchased soda ash by the lime causticising process.

**140. Nitrogen industries—(1) Fertilisers.**—In Chapter III we have already referred to the fact that the outturn of most crops in India is very much below that of other important countries of the world and that the outturn of many crops in this province is about the lowest in India. One of the most important causes of this is the inadequacy of nitrogen, a principal crop food, in the soils of the province. The application of manure containing nitrogen to irrigated, field and garden crops has given very good results. There are over 15 lakh acres under irrigated crops in the province. The outturn of these crops could be nearly doubled by the use of adequate quantities of fertilisers. Recent experiments have shown that the application of 100 lbs. of ammonium sulphate and 50 lbs. of double superphosphate has increased the rice yield per acre from 761½ lbs. to 1,791½ lbs.‡ and gave a net extra profit of Rs. 10-3-0 per acre at pre-war rates.

The quantity of fertilisers used in India is negligible, and the yields of Indian crops are very low, being usually a fourth of what are obtained in other countries. Even a small and industrially backward country like Egypt uses 233 lbs. per acre (as against India's 0.61 lb. per acre) and gets an yield of 3,000 lbs. of rice per acre as against 820 lbs. in India. Korea, Japan and Italy are obtaining still higher yields, four to five times those of India. This is true also of

\*Report of the Indian Tariff Board on Heavy Chemical Industry, 1929, paragraph 23.

†Ibid., paragraph 27.

‡Report on Rice Research Scheme.

other food crops like wheat and of money crops like tobacco and groundnuts and fibre crops like cotton.\*

The use of fertilisers in this province began only recently and practically the whole quantity used was sold through the Department of Agriculture. In 1939-40, 16,684 mds. were sold, which is the largest on record. Practically the whole of it was ammonium sulphate. Since 1940, the consumption has fallen on account of the difficulty of getting the manure, and in 1940-41, it was less than half of the previous year. The main factor which weighed in the past against the more extensive use of fertilisers was their high cost relatively to the value of the produce raised and the consequent small margin of profit. From 1929 to 1938, the prices of agricultural produce were so low, and the financial condition of the agriculturists so bad, that any extensive use of artificial manure was out of the question. When prices rose and the use of fertilisers became remunerative, the latter became practically unobtainable.

On the basis of the previous sales, the Provincial Agriculture Department has estimated that the annual requirements of ammonium sulphate of the province as a whole will be in the neighbourhood of 10,000 tons from 1950 onwards. We are definitely of the opinion that this estimate errs on the side of excessive caution. We are assured not only by officers in close touch with the cultivator, but also by experienced and knowledgeable non-officials that, provided that Government guarantees a fair price for agricultural produce and undertakes to supply the fertiliser at a reasonable price, practically all the irrigated areas in this province would use fertilisers. It is well known that, once the cultivator is convinced of the profits likely to accrue from the use of artificial fertilisers, he needs no further persuasion to use them. On this assumption we estimate the eventual consumption of ammonium sulphate at well over a lakh tons as below :—

			Tons
Rice	..	..	92,600
Wheat	..	..	2,200
Sugarcane	..	..	2,200
Vegetables	..	..	14,000
Potatoes	..	..	3,700
Oranges	..	..	6,500
Total ..			117,870

Besides ammonium sulphate, about 45,000 tons of superphosphate or an equivalent quantity of phosphatic manure in the form of bone-meal would also be required. Our recommendations on the subject of preparation of bonemeal are contained in Chapter VIII. As the cultivation of vegetable and fruit crops, for which there is considerable scope in the province, increases, the demand for fertilisers is bound to increase still further. We, therefore, feel convinced that given adequate facilities, the most important of which are, (a) a Government guarantee of fair minimum price for agricultural produce, (b) the supply of fertilisers at reasonable cost and (c) a liberal system of taccavi advances, this province will easily consume 50,000 tons of ammonium sulphate per annum even at the present time.

Fair prices have already been guaranteed to the farmers in England and have been recommended for India by the Imperial Council of Agricultural Research: "A major difficulty is the uncertainty

of the price which the cultivator may get for his produce. Unless he knows what he is likely to obtain, he cannot afford to spend money in trying to increase his outturn, lest the value of the increased production may be less than the expenditure that has to be incurred for obtaining it. One of the greatest steps forward to intensify agricultural production in Great Britain is the guarantee of price and off-take of produce which Government has given to farmers for a specified period.”\*

As we are very favourably situated from the point of view of raw materials and power, we strongly recommend the establishment as soon after the war as possible, of a nitrogen fixation plant to manufacture enough ammonia for producing the equivalent of 50,000 tons of ammonium sulphate and initially of 3,000 tons of nitric acid per year next to the proposed Central Power Station. The process used will be the fixation of atmospheric nitrogen by hydrogen obtained by the action of steam on coal using any of the well-known processes. For this purpose even as Germany uses lignite†, local non-coking coals will be used, if necessary, after carbonisation. The conversion of ammonia to ammonium sulphate has to be investigated further in order to ascertain whether direct neutralisation with sulphuric acid or manufacture by the gypsum process is cheaper.

The raw materials required are coal and gypsum or sulphur according to the process adopted. Coal is available nearby, but gypsum will have to be brought from Rajputana. The alternative material sulphur for sulphuric acid manufacture will have to be imported from abroad.

The Fertiliser Mission proposed that a factory with a capacity of 350,000 tons, required immediately by the Government of India in connection with their “Grow More Food” campaign, should be built at Harduaganj near Aligarh, but this has been rejected by the Government of India who preferred Sindri near Dhanbad in Bihar, presumably because it is situated in the coalfield. As regards the other principal raw material, viz., gypsum, the Central Provinces is nearer the source than Bihar. Both from the point of view of raw materials and of the facilities for transport, therefore, the Central Provinces should come high in the order of priority for fertiliser manufacture.

The question whether small factories can produce as cheaply as larger units has been raised by the Fertiliser Mission. But if the factory is put up near the Central Thermal Station, large-scale economies in capital and operating costs are bound to accrue in the form of common boiler plant, cooling arrangements, water-supply, standby power plant, etc. The main items of increased cost in small-scale manufacture considered by the Mission are under heads (1) power and (2) interest and depreciation on capital which together add up to about Rs. 29 and Rs. 76, respectively, per ton of ammonium sulphate manufactured in the large and small factories. Pass-out turbines will supply the steam requirements of the factory. Under these conditions, the 50,000 ton factory should be as economical as a larger one while its situation nearer the consuming markets will be a circumstance in its favour. Moreover the size of the unit suggested, viz., 50,000 tons, is by no means small as the majority of foreign factories are actually much smaller.

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\**Memorandum on the Development of Agriculture and Animal Husbandry in India*, by the Advisory Board of the Imperial Council of Agricultural Research, page 35.

†*U. S. A. Tariff Commission Report on Chemical Nitrogen, 1937*, page 124.



As the demand for fertilisers in India will be almost unlimited, the question of erection of more factories is bound to arise soon after hostilities cease. No matter what criterion is adopted, whether it is the principle of regionalism or the availability of raw materials, this province will have to be given high priority in the matter. The 50,000 ton plant we recommend may with certain alterations be adapted to produce anything up to 100,000 tons. In which case it is desirable for the Provincial Government to take one of the neighbouring provinces into partnership in the fertiliser factory thus reducing its own liability considerably.

Research is necessary to find out what kind or kinds of artificial manure are best suited for the soils of the province. As the Royal Commission on Agriculture pointed out\* there is such a variety of soil conditions and climate in the country that unless these fertilisers are produced after a careful study of the various soils under working conditions and in closest consultation with those engaged in agriculture it is useless to look for the best results from their application. If, for instance, research indicates that ammonium nitrate is more suitable than ammonium sulphate, it will be much easier for us to manufacture the nitrate as we have all the raw materials necessary and sulphur is not required.

**141. Nitric acid.**—A ten-ton-a-day nitric acid plant should be established side by side with the nitrogen fixation plant. The main raw material, ammonia, will be obtained from the fertiliser factory. The finished product will be mostly used in the nitro-cellulose factory, and the balance will meet the requirements of the trade.

**142. Nitro-cellulose.**—A ten-ton-a-day nitro-cellulose factory will be established mainly for defence requirements, but in peacetime for the manufacture of celluloid, lacquers, paints, lacquered fabrics like rexine, etc. The present requirements for defence purposes are met from a factory in a south Indian hill station where no raw materials are available locally and where transport is not only expensive and uneconomical but also troublesome. There is in fact little to recommend it, except its salubrious climate. Competitive production is therefore out of the question. It is moreover wrong policy involving waste of national resources to sink large sums of money in ordnance factories to be maintained as uneconomic units in peacetime, while the purpose can be equally well served by planning them as factories engaged in civil production with a war potential that can be called into action in an emergency. The raw materials required per ton of dry nitro-cellulose are roughly† one ton of nitric acid, 10 cwt. of sulphuric acid and 12 cwt. of cotton linters or wood pulp. Large quantities of water will also be required. All these will be readily available in the Nagpur area. This is about the only province where the main raw materials of the industry, coal and cotton, are available side by side. A large consumer factory is also situated in the province. The consumer factory's requirements of nitro-glycerine can also be met from this factory more economically because of our potential resources of glycerine and the short distance between the producing and consuming factories.

All the above nitrogen industries should, in our view, be State-owned and State-managed as they are vital industries for the defence of the country. The nitro-cellulose industry, in particular, will have to be taken up and worked by the Central Government in view of its importance from the security point of view. As the nitric acid and

\*Report of the Royal Commission on Agriculture, pages 81 and 82.

†Chemical Engineering Flow Sheet No. 18, McGraw-Hill, 1949.

the fertiliser factories produce the raw material for the nitro-cellulose industry, the Central Government should undertake the running of these factories also, though they may be run on commercial lines. The Provincial Government should, however, take a large part of the share capital of the fertiliser factory as the province is vitally interested in the manufactured product.

**143. Sulphuric acid.**—"Sulphuric acid is the vital base chemical for almost all industries. From it are produced other important chemicals essential for a variety of purposes. The consumption of sulphuric acid is, therefore, rightly considered an index of a country's industrial development."\* There are no factories in the province producing sulphuric acid with the result that we export raw materials instead of finished chemicals. Thus instead of supplying India's requirements of aluminium sulphate, we export large quantities of bauxite to the acid works in the United Provinces and Bengal. However, as has been mentioned above, two small factories adopting the chamber process, are under erection, one at Kanhan and the other at Katni.

The aluminium sulphate works proposed for Katni is estimated to use 20 tons of acid per day, and it is probable that a similar quantity will be consumed by other industries, existing and proposed. Thus an extra capacity of 20 tons a day may become necessary in due course.

To meet this demand, two ten-ton-a-day contact process plants should, we consider, be erected, one at Katni and the other in some suitable centre to be decided later.

The raw material required is sulphur in the case of the contact plant, and very small quantities of nitre, in addition, for the chamber process. The sulphur has to be imported, but as the Tariff Board have pointed out, absence of sulphur is no insuperable obstacle,† for, among the countries with a well-developed chemical industry, the U. S. A., Italy and Japan are the only ones which possess substantial deposits of sulphur. Besides, it is always easier to import sulphur than the acid. The quantity of sulphur required is also less than a third of the weight of the sulphuric acid produced.

Markets for the acid will be available as both sulphuric acid and its salts are used in many industries like textiles, paper, leather, paints, varnishes and for other miscellaneous purposes. The plant proposed does not take account of the requirements of the proposed fertiliser factory which will have to make the sulphuric acid it needs. The manufacture of phosphates and superphosphates will also require large amounts of the acid.

The industry should be promoted by private enterprise.

**144. Alkalies—Soda ash and caustic soda.**—Hardly any alkalies were produced in India before 1940. In 1938-39, we imported 65,941 tons of soda ash valued at Rs. 64.4 lakhs and 24,857 tons of caustic soda valued at Rs. 45 lakhs.‡ Since then however important producers have come into operation notably the Alkali and Chemical Corporation of India—a subsidiary concern of The Imperial Chemical Industries—with a capacity of 20,000 tons of soda ash a year and a large amount of caustic soda. About 18,000 tons of the soda ash will be

\*Report on the Development of Industries for War Supplies, by Dr. P. J. Thomas, page 22.

†Tariff Board Report on Heavy Chemical Industry, 1929, paragraph 25.

‡Accounts relating to the Sea-borne Trade and Navigation of British India for March 1939.

produced by the Tata Chemicals and an equal quantity by the Dhran-gadhra Chemicals. These large units may be profitable but there is a good case for the dispersal of the industry into minimum size economic units in other centres, well-placed for raw materials and nearer consuming markets. The production of alkalies in the province itself is negligible.

**Soda ash.**—We consider that a factory capable of an output of 20 tons of soda ash a day, or, say, 6,000 tons a year, should be established at Katni. The process employed will be the ammonia soda process which is in common use.

The main raw materials required per ton of commercial soda ash are, roughly 1.5 to 1.7 tons of common salt and 1.2 to 1.35 tons of limestone.\* The coal requirements will be below one ton. Of these, salt will have to come from the sea coast. Considering that the railway freight on soda ash is more than thrice that on salt, the import of salt will be fully justified. Other advantages like availability of limestone and coal also point to local manufacture. Large quantities of water required will also be available. Power requirements are negligible.

3,000 tons of the soda ash produced will be used for caustic soda manufacture. The remaining 3,000 tons will have to find local markets. The glass factories of the province have an estimated capacity of 5,000 tons of glass per year and would require about 1,400 tons of soda ash. The balance of 1,600 tons can be reserved for other industrial requirements like paper and textile manufacture, washing soda, water treatment, etc.

**Caustic soda.**—A caustic soda plant producing nine tons a day is proposed for Katni. The factory will be associated with the soda ash factory and will use 12 tons of the soda ash a day and use burnt lime for causticising. Coal can be had from the Rewa coalfield and as there is also abundance of good limestone locally, the factory will be favourably situated for raw materials.

About 1.5 tons of caustic soda per day will be used in the aluminium hydrate works proposed for the area. The balance will be used in industries like paper manufacture, textiles and soap manufacture on an increasing scale during the post-war period.

Another ten-ton-a-day caustic soda plant is proposed for the Chanda area which will be associated with the proposed paper mill there. The manufacture will be by electrolysis of common salt. About 1.7 tons of common salt will be required per ton of caustic soda.† The other large items required are about 2,500 Kw. of electrical energy and 20,000 lbs. of steam. The combined requirements of process steam and power for both the paper mill and the caustic soda plant can, as explained in Chapter VIII, be provided by a common power station running on coal obtained from the nearby collieries but some adjustment of production capacity in these inter-related units will be necessary if the most economical results are to be produced. About 3 tons of the caustic soda produced will be used every day in the paper mill and the balance can be sold for the industrial uses already mentioned.

**145. Bleaching powder and chlorine.**—About 1,750 lbs.‡ of chlorine will be available per ton of caustic soda made as a by-product. A part of this will be consumed in the paper mill. Some part of the balance will be used for making bleaching powder or sold as liquid

\**Chemical Engineering Flow Sheet No. 51, McGraw-Hill, 1940.*

†*Chemical Engineering Flow Sheet No. 15, McGraw-Hill, 1940.*

chlorine both of which will be required in textile mills and water works. Some chlorine can be used for making hydrochloric acid by burning hydrogen, another by-product, in chlorine.

All these alkali industries should be financed and managed by private enterprise.

**146. Industrial alcohol.**—There are two distilleries in this province, one at Seoni and the other at Betul. The buildings belong to Government and the plant and machinery to the distillers who hold contracts for the wholesale supply of country spirit. Contracts are generally given for 3 years on tender. One of the conditions of the licence is that, on the expiry of the contract, the plant and machinery shall be taken over by the incoming contractors or Government at a fair price. The plant at Betul includes one Coffey still and at Seoni one pot-still and one Ilges still. The manufacturing capacity of each distillery is from 3 to 4 lakh London proof gallons a year.

The flowers of *Mahua* (*Madhuca latifolia*) are the base from which spirit is manufactured at the two distilleries. The tree flowers in March and April. Each tree yields about 2 to 4 mds. of flowers having thick corollas of pale cream colour. They are dried in the sun when they turn reddish brown. The *mahua* flower has very good food value. It contains about 60 per cent sugar, 42 to 55 per cent of which is invert sugar, and the rest cane sugar. The tree grows wild throughout the province but chiefly in Betul, Chhindwara, Hoshangabad, Nimar and Chanda districts. Next to molasses, *mahua* is the most important raw material for the manufacture of alcohol. *Mahua* seed is also valuable as it contains a high percentage of oil which is mostly used for making soaps. We have recommended in Chapter VIII that Government should see that this valuable tree does not die out.

Only potable spirit is produced at the distilleries at Betul and Seoni at the strength varying from 25° to 30° O.P. which is reduced to 60° and 45° U.P. before it is issued for consumption. Both the distilleries are at present working to full capacity to meet the increased demand for liquor. At Seoni alcoholic fermentation is done by the indigenous process of mixing the flowers with spent wash and water and passing the wash including the solid flowers into the pot-still. Of late the distillers are using sulphuric acid and sulphate of ammonia to accelerate fermentation. The spirit produced in the pot-still is redistilled in the Ilges still. Some of the wash excluding solid flowers is also distilled in the Ilges still. At Betul a better process is employed under which the juice is extracted by macerating flowers with water. The juice is fermented by adding sulphuric acid and ammonium sulphate and when ready, it is charged to the Coffey still. The distillers depend upon the wild yeast present in the flowers. Pure yeast should be cultured for proper and healthy fermentation. By-products such as fusel oil are not separated. On the contrary, these latter run to waste as spent wash or refuse and flow into the town contaminating the atmosphere. Under the existing arrangements and with the present plant, it is not possible to manufacture rectified spirit or absolute alcohol, or even to collect the by-products.

If the distilleries are to play their part in the post-war development of the province, we are convinced that the present system of working through contractors should be abandoned and modern distillery plant installed to produce spirit at a higher strength and on a larger scale. We feel that the Provincial Government should run the distilleries as a State-managed industry. From the financial point of view there should be no difficulty as Government derives revenue

of several lakhs of rupees from the sale of country spirit. If, however, the distilleries were to be leased to private contractors they should be given to enterprising industrialists on long-term leases.

It is hardly necessary to emphasise that the alcohol industry should be developed. Rectified spirits and absolute alcohol are required by several industries. Perfumers and makers of essences employ it for dissolving essential oils, etc., and for the extraction of scents from flowers. Pharmacutists and chemists use it in the preparation of tinctures, stimulants, tonics and other medicinal preparations. Anatomists, naturalists, and chemical analysers use alcohol in their work. It is largely consumed in the manufacture of varnishes, lacquers, etc. It is also used as liquid fuel.

**147. Glycerine.**—As soon as the soap factories working on modern lines proposed elsewhere in this report are established, a central factory for refining the crude glycerine collected from these works should be established near about the Central Thermal Station where the manufacture of nitro-glycerine has been suggested for defence purposes.

## CHAPTER XI.—ENGINEERING INDUSTRIES

**148. Present position.**—There is no engineering industry in the province manufacturing for the open market worth mentioning. The largest concerns engaged in the industry are the ordnance factories at Jubbulpore, Khamaria and Katni, employing 11,000 workers in all, the Railway Workshops employing 900 men and the Telegraph Workshop employing 2,360 men. The Ordnance Factories, except the Gun Carriage Factory, have been established in connection with the war effort. They are well-equipped and manufacture gun parts, mountings, shells and a variety of other products for war purposes. They have gathered together large numbers of skilled workers from all parts of the country, developed housing estates and secured power connections all of which will be useful in peacetime for developing a new engineering industry. A considerable volume of high precision work is done in these factories and they have a number of general duty and high precision machines installed in them which will form useful adjuncts to any large manufacturing works.

The Telegraph workshops at Jubbulpore established during the war are engaged on producing the requirements of a rapidly expanding Telegraph Department. The heaviest items of work in this factory are the fabrication of Hamilton poles from sheet metal, manufacture of cross-arm brackets, insulator stocks, etc., and galvanising them. The factory also makes instruments and instrument parts.

The National Insulated Cable Company of India has established a small industry at Mehgaon, near Katni. They have installed in the factory two wire-drawing machines believed to have been originally used in a wire-nail works. At present they draw out copper wire to Government specifications from hot rolled wire imported from Africa. The industry may not survive long after the war and even at present employs only 267 workers.

Engineering workshops in the province are mostly small. The ten cotton mills, the cement factory and two of the collieries have their own repair shops. In 1937, there were 18 general repair shops employing some 450 workers. Now there are 26 employing 1,140 workers. The expansion is explained by the heavy pressure of work

directly or indirectly connected with the war. Half the number of these shops have foundries attached to them, their usual capacity being half a ton per charge.

At present they are mere repair shops but there is no reason why, when the present pressure of work ceases, they should not devote part of their capacity to small-scale manufacture.

No figures of imports into the province of agricultural implements, pumps or other small machinery are available, but there is no doubt that there is considerable import from Bombay and the Punjab. There is scope for starting an industry in the province to displace present imports as well as to provide for the increasing use of machinery in agriculture.

A re-rolling mill established in Nagpur did not succeed as scrap became scarce and steel prices came under control.

In the absence of any metallurgical industry there is little present scope for large engineering works in the province. At the same time there is no reason why ordinary items of machinery required for our existing industries should not be manufactured locally. An industry like the engineering industry will have to be built up carefully but in rapid stages and will need considerable State assistance, if it is to be established at all. Most of such assistance could appropriately be given by the Industries Department, if that department is reorganised to deal with industrial engineering work as recommended by us in the sequel.

**149. Government Central Workshop and Stores.**—(a) As a first step, it is proposed that Government should start a fairly large size foundry and mechanical and electrical workshop using the present Engineering School workshop as a nucleus. A start may be made on a modest scale and the shop should be planned initially to deal with Government and other work. The Public Works Department spend about Rs. 1 lakh annually for repairs and renewals to machinery used mainly for road making and that department, we have been told by the Chief Engineer, would welcome the proposal for a central workshop and stores. Other departments of Government should also be required to use this workshop as much as possible. A Stores Department run side by side would enable Government policy in the matter of stores purchase being enforced and Government departments and public bodies obtaining supplies at favourable rates.

(b) The organisation visualised will be under the control of the Director General of Industries and will be in charge of a Superintendent of Workshops and Stores. The stores will be a separate establishment and will deal exclusively with the requirements of Government departments and public bodies. This section will be made self-supporting by a suitable percentage charge on the price of all articles. Government will decide the nature of the stores dealt with and increase the scope of the work to encourage any specified industry in the matter of Government purchases or to include new items by orders issued from time to time. The workshop will work on commercial lines except that it will be required under certain conditions to supply castings and machine parts to small-scale industries and to the Industrial Research Institute and workshops proposed, at concessional rates but not below the actual cost of manufacture leaving out of consideration overhead charges. The Education Department may continue to use the workshop for instructional purposes and make a contribution towards its maintenance more or less based on their present expenditure under this head.

**150. Industrial Institute.**—Side by side with the Central workshop a separate organisation will have to be established to conduct research into the problems of small-scale and cottage industries and to design the special types of machinery required for the purpose. It will be the duty of this organisation to plan new industries and if necessary to work out such schemes on a factory scale until these are taken over by private enterprise.

Some idea of the nature of the work to be carried out by the proposed industrial institute and workshop can be conveyed by a few typical examples

**I. Research.**—(1) Conversion of discarded motor engines after reconditioning them into stationary engines for use with producer gas as rural power units for pumping and other duties is an attractive proposition. Considerable research would be necessary before a satisfactory unit can be evolved.

(2) Design of furnaces for using various types of fuel and refuse like rice husk for industrial as well as domestic purposes is a subject that calls for study.

(3) Improving agricultural implements, bullock carts, water lifts, etc., will come within the scope of the work of the proposed Institute.

**II. Planning small-scale industry.**—Complete working schemes prepared may, for example, include the following industries:—

Cutlery, hardware and electro-plating, pumps and other small machines, oil expeller spare parts, scientific apparatus for schools and colleges, agricultural implements, toys, electrical goods, instruments, woodware, laminboards, plywood, matches, bobbins, looms, bone crushing, sizing and finishing machinery, chlorinators, tiles and bricks, etc. Pending the establishment of an organisation for enforcing standards of quality in the products of small-scale industry, the Institute may undertake this work also. It will also maintain a library and information bureau.

Small-scale industry schemes evolved by the Institute which are considered suitable can be worked by co-operative workshops run by war-retained technical personnel. The Institute may be in charge of the Industrial Engineer or other officer entrusted with those duties so that experience gained in the field may be available to the research Institute. The workshop will be provided with such specialised equipment as is required to carry out investigations into various processes but will depend on the Central Workshop for the actual manufacture of the machinery designed. While there will be a nucleus staff of investigators, fitters, mechanics and smiths, special investigators will be employed to work out the new schemes sanctioned by Government. These investigators may be a chemist, metallurgist, a ceramic expert, etc., according to the scheme to be investigated. It is proposed that a chemical and testing laboratory be built up in the Institute as and when the work progresses and this will be the forerunner of a Bureau of Standards dealing with all problems in enforcing standards of quality in industrial production and grading of manufactured goods. While the Institute as stated will be under the control of the Industries Department, its facilities will be open to all departments requiring the use of the same. For example, the Forest Department will have a section in the Institute to deal with the problems relating to the industrial utilisation of minor forest produce. The Co-operative Department will have its demonstration workshop for cottage industries established in the Institute.

**151. Analytical Chemist.**—An analytical chemist will be attached to the Industrial Institute for undertaking ordinary chemical analysis required by the industry. He will also help in all research work required at the Institute. Testing and grading of industrial products may have to be undertaken by this section in due course.

**152. Industrial and Commercial Museum and Emporium.**—Mention has already been made of a library and information bureau attached to the Institute. Side by side should be opened an Industrial and Commercial Museum exhibiting raw materials—forest, agricultural and mineral—available in the province and showing possibilities for the manufacture of finished products by suitable photographs, flow sheets, cost estimate sheets, etc. There will also be on show samples of finished products of provincial industries and an emporium for the sale of certain selected products of cottage and other industries.

**153. Agricultural implements factory.**—The Central Province being a large agricultural province there is considerable demand for agricultural implements such as pouldas, pick-axes, ploughshares, etc. The Public Works and Forest Departments also require a large quantity of such implements. It is therefore desirable to establish a factory for the manufacture of these implements in the province. The Provincial Government should interest private capitalists in the enterprise and, if necessary, take some 10 per cent of the share capital.

**154. Divisional Government Workshops.**—In addition to the central workshop two or three workshops should be established in centres like Jubbulpore, Amraoti and Raipur to serve the similar needs of the areas concerned. They can also be used by technical schools for instructional purposes. These workshops will be under the control of the Divisional Assistant Industrial Engineer concerned but under the immediate charge of a whole-time mechanical supervisor. These small workshops are not likely to be self-supporting for some years and the expenditure will have to be treated as necessary for fostering industrial development.

**155.** While in this chapter no recommendation has been made for the establishment of large-scale engineering industries, it is not our intention that the province should not take its place in the general expansion of such industries in the country. The Government of India are considering the establishment of these as of other industries on a regional basis. The Committee are of opinion that the Central Government's plan on the subject of engineering should provide for the manufacture in this country within the next ten to fifteen years of most of the items of mass-produced machinery and machine parts in large demand in the country, such as motor cars, small oil, gas, and steam engines, steam road-rollers, tractors, portable steam engines and boilers, ball and roller bearings and textile machinery. This province should be allotted its due share of these manufacturing industries, and especially those that can fit into the expanded war factories. These establishments brought into the province during the war should not be closed down or removed elsewhere and while a section may be reserved for the peace-time requirements of the defence services the remaining equipment should be adapted for commercial manufacture thus avoiding dislocation, and ensuring that the war potential of these factories is retained as far as practicable against future emergencies. Nor should the tempo of war-time production of these factories when diverted to peace-time needs be allowed to slacken, as the urgency of peace-time requirements is no less



great than that of war. These developments will require large imports of machinery and machine tools. It has been suggested that on the cessation of hostilities India should purchase serviceable machinery and equipment of various types in U. S. A. and Britain which is surplus to the needs of those countries. We endorse this suggestion, although there has been some ill-informed criticism of it based largely on a misapprehension of the proposal. Indiscriminate purchases are never satisfactory. But it would be foolish not to take advantage of the low prices of surplus machinery, if they be of the type we need. Russia built her automobile industry on such equipment. Australia's iron and steel and munitions industry is based on surplus machinery obtained from the United Kingdom after the last war. We will also have to do likewise if we are to speed up our programme of development.

## CHAPTER XII.—REORGANISATION OF THE INDUSTRIES DEPARTMENT

156. In accordance with the recommendations of the Indian Industrial Commission, a separate Department of Industries and the post of a whole-time Director were created in this province in September 1918. But the post of the Director was combined with that of Registrar, Co-operative Societies, in February 1919 with a view to co-ordinating the work of the Co-operative and Industries Departments and also as a measure of economy. This arrangement continued till the 1st May 1940, when the posts were separated and a whole-time Director with technical qualifications was appointed. The post of the Deputy Director was abolished at the same time and the Director was also appointed Labour Commissioner which office he retained till April 1942. Unfortunately the appointment of the whole-time Director synchronised with the beginning of the war and a good deal of additional miscellaneous work such as price control, licensing of trade, war supplies, etc., was given to him.

If we exclude from consideration the sections dealing with the important statutory duties of inspections of boilers and factories, electrical undertakings, etc., the Department of Industries consisted till recently of a part-time Director, an Inspector of Industrial Schools, since combined with the post of Headmaster of the Nagpur School of Handicrafts, a Textile Expert and the Curator of the Museum. It is not surprising therefore that the departmental achievement in the industrial line is not impressive. But it is more a matter of policy than staff and frankly we never adopted the policy of actively encouraging industries. The Retrenchment Committee consisting of a number of elected members of the Legislature did not hesitate to abolish the Tanning Expert and the Tanning School as a measure of economy ignoring the great importance to the province of the tanning industry.

The Provincial Banking Committee complained that the main recommendations of the Indian Industrial Commission had not been carried out, that the Registrar of Co-operative Societies considered the Directorship of Industries a mere appendage to his other functions and referred to several other drawbacks.\* The fact is, the Department of Industries as constituted in the province was incapable of carrying out the functions assigned to it by the Indian Industrial Commission. When the appointment of a whole-time Director was made eleven years after Mr. Bourne's Committee recommended it, the war had

\*See "Paragraphs 1251, 1298, 1302—1305, 1323, 1329, etc., of the *Report of the Provincial Banking Enquiry Committee*.

already entered on an acute phase and normal working was out of the question. The one evil result of our inaction in the past is that Government has no industrial experience whatever and starts on its career of planning for industrialisation with a serious handicap. If, for example, it is desired to electrify the province and set up thermal stations, Government has no business experience at its back to draw upon. But risks must be taken, as the work is so urgent and important as to brook no delay.

Under the state of affairs we visualise, there will be a properly-staffed and well-equipped Department of Industries which will be capable of carrying out the very important and extensive functions which, with large-scale planning and industrialisation and large-scale State aid to industry, will devolve on it. For, it is through the Department of Industries that the State will in future regulate and assist industry, collect statistics, conduct enquiries and do a host of other things.

**157. Directorate-General of Industries** -- The head of this enlarged department should be styled Director-General of Industries and should be a man of the rank of Financial Commissioner and receive a salary of Rs. 3,500 a month. He should be not only a man with high academic qualifications but also, if possible, one who has had considerable experience of actual industry, should preferably have worked in some large manufacturing or business firm. He should have initiative, drive and executive capacity of a high order. He may be appointed on short-term contract or permanently according to circumstances. As regards the age of the incumbent on appointment, it may be anything up to 55 years of age in the case of a five-year contract, provided that every other condition is satisfied. It may not be possible to get younger men of the requisite experience and qualifications.

He will have three deputies styled Deputy Directors-General in charge respectively of administration, technical matters and commercial and business sides of industrialisation. Each of these will draw a salary of something like Rs. 2,000 a month. Under them will be a Director of Statistics and Commercial Intelligence, the Chief Electrical Engineer, Mining Adviser, Industrial Chemist, a Textile Expert, a Leather Expert and so on with the functions briefly indicated below :--

(a) **Director of Statistics and Commercial Intelligence.**—The collection of industrial statistics has already been suggested in another chapter. A first class statistician will be required for distribution of information on industrial and commercial matters, for compiling industrial statistics and for their interpretation.

(b) **Textile Expert.**—The activities of the Textile Expert should be expanded, if necessary, by the appointment of a new Director of Textiles who will be in charge of Textiles. His duties will be to help the small-scale industries and this is likely to include both pioneering and demonstration. He will have to interest himself in new designs of looms, the improvement of power loom establishments, and generally in the organisation of these industries on competitive lines. He will advise the department and Government on matters relating to textile education and on the textile industry.

(c) **Leather Expert.**—In view of the extreme importance of leather and tanning to the province, the appointment of a Leather Expert is suggested for pioneering and demonstration duties in connection with improved methods of flaying and curing of skins and hides. He will advise on welfare matters relating to the chamar community and also on all leather matters.

The organisation of the bone-meal industry in the province will also be under his charge. He will also survey the tanning material resources of the province and advise how such materials can be utilised to the best advantage in co-operation with the utilisation branch of the Forest Department.

(d) Industrial Chemist.—The Industrial Chemist will deal with all problems relating to the chemical and processing industries helping in the planning of new projects and also keeping industrialists in touch with research work done in subjects in which they are interested.

(e) Industrial Engineer and Superintendent of Industrial Institute.—An Industrial Engineer with four Assistant Engineers, one in each division, is proposed. The main duties of the Industrial Engineer will be to help small organised industries in the maintenance of their plant and machinery on payment, if necessary, of a nominal amount to Government annually. The services of this establishment will also be available to other Government Departments, to Industrial Co-operatives and for the proper running and maintenance of municipal waterworks pumping plants of which we anticipate there will be many. The Director of Industries will conduct detailed surveys of likely industries and publish information so as to interest industrialists in new projects, largely with the help of this establishment. The duty of pioneering new enterprises with a view to handing them over later to private industrialists for working will have to be entrusted to this establishment which will also give technical advice to industrialists and keep them in touch with research work on subjects in which they are interested. Costs of manufacture will be studied and suggestions for economies in production made. The Industrial Engineer will also be in charge of weights and measures.

(f) General Superintendent, Central Workshops.—An officer of the same status as Industrial Engineer will be required to run the proposed Central Workshop and Stores. These workshops will have to be run on commercial lines.

While the above appointments suggested are of a permanent nature there should be provision to engage for specific enquiries, specially qualified men on short-term contracts.

As work increases, the requisite staff will be provided.

Library and Information Bureau.—The Director-General's office must be equipped with a library containing up-to-date books on every subject connected with industries in charge of a competent and technically-qualified Librarian and attached to it will be an Information Bureau. The Library and the Bureau will be under the control of the Director of Statistics and Commercial Intelligence.

### CHAPTER XIII.—STATISTICS AND COMMERCIAL INTELLIGENCE

158. The importance of statistics bearing on industries cannot be overestimated and one of the most serious difficulties in planning for industrial expansion in India is the absence of systematic and comprehensive statistics, for, apart from the fact that statistics provide a guide to the industrial progress of a country, they are vital as being the materials on the basis of which alone a sound industrial policy can be formulated. Referring to the Empire Statistics Conference, which sat in January and February 1921, the *London Times* said: "In Germany before the war the Statistical Bureaux were ceaselessly employed in working on everything that illuminates the future of the German

people; and in the era which is now opening there can be little doubt that the nation which studies the drift of events as it is revealed by the statistical analysis will be infinitely better equipped to take advantage of its opportunities than another which perhaps trusts only to the methods of empiricism." The Committee appointed in 1912 to examine and report upon the Official Statistics of Canada remarked that there had been no general answer to the question: what are the phenomena requiring the scientific measurements supplied by statistics, if Canadian national development is to proceed to the best advantage? It went on to say: "Lack of unity and co-ordination prevents true comparisons between Canada and other countries. The recent growth of international intercourse has rendered such comparisons more than ever necessary, and they have become indispensable to the national progress of Canada." Again the Official Year Book of the same Dominion for 1922-23 states: "Statistics are not merely a record of what has been, but are for use in planning what shall be; it is the duty of a Statistical Bureau to assist directly in the day-to-day problems of administration as well as to provide their theoretical back ground." One of the most significant of developments in administration is the extent to which statistical organisation has been increased as a guide to national policy. Mr. R. H. Coates, the present Dominion Statistician of Canada, writes: "Organised co-ordinated effort is essential to the progress of the administrative equipment of the country, and the statistics are the corner stone—the basic organisation without which the endeavour to meet new situations will be seriously handicapped." Again Mr. G. H. Knibbs, formerly Commonwealth Statistician of Australia, in a paper read before the British Royal Statistical Society in January 1920, said: "A Department whose duty it is to keep the Government, publicists, and the economists and the nation generally, informed as to the movement of every important activity in it, and of population facts, is of obvious value if intelligent direction is to be given to national affairs, or an intelligent study of them is to be made possible. To a large extent existing statistics are a side-product of various government or other departments produced mainly as a sort of public advertisement of their activity or for departmental use, each acting on its own initiative, the whole uncoordinated and often without appropriate technical direction."\*

These observations are just as true of India.

159. The various Commissions and Committees appointed in this country from time to time have all emphasised the need for statistics. The Indian Industrial Commission of 1916—18 in Chapter XI of their report, dealt with the matter, and the office of the Director-General of Commercial Intelligence and the Indian Trade Journal were the direct outcome of their proposals. The Indian Economic Enquiry Committee, presided over by Sir M. Visvesvaraya, recommended the setting up of a Central Bureau and Provincial Bureaux for the collection and compilation of statistics of every description. The Royal Commission on Agriculture in India dealt in detail with statistics in Chapter XVIII of their monumental report and drew attention "to the increasing importance which is being attached all over the world to statistical research as an aid to the formulation of social policies", and made various recommendations including the reconstitution of the Department of Statistics as a separate Department, styled the Central Bureau of Statistical Information which they hoped would in time become something like a Royal Statistical Society for India. They also recommended the appointment of highly-qualified statisticians at the

headquarters of each Provincial Government. Nothing however came of all this, at any rate, as far as this province is concerned. The Labour Commission referred to the inadequacy of statistics and commented on the fact that they threw little light on the economic position of the worker. They also referred to the impression in some quarters that the collection of statistics relating to the standard of living, the earnings of workmen, and their expenditure, etc., was a luxury in which only rich countries should indulge. This they regarded as a profound error. They thought that policy could only be built on facts and so long as there is uncertainty as to the facts there must be confusion and conflict regarding the aim. The absence of accurate statistics regarding the life of the workers constituted, according to them, a serious handicap to intelligent efforts to better their condition. They were of opinion that no extensive progress can be made without statutory powers and endorsed\* the earlier recommendation of the Visvesvaraya Committee that a Central Act should be passed enabling the authorities to collect the requisite information regarding industrial labour, collect information from employers regarding the remuneration, attendance, living conditions of industrial labour, from merchants regarding prices, from moneylenders regarding loans to workers and from landlords regarding rentals.

**160.** In order largely to implement this recommendation, the Provincial Government passed the Central Provinces and Berar Collection of Statistics Act in 1939, but no rules have been framed under this Act and it has not yet been put into operation. The matter was at last taken up by the Government of India and the Industrial Statistics Act, 1942 (XIX of 1942), was passed "to facilitate the collection of statistics of certain kinds relating to industries". This Act has also not yet come into force as the Government of India have only just issued a set of model rules for adoption by Provincial Governments, but it is expected that the machinery will start moving from 1st April 1945.

Such briefly is the history of the efforts to provide a system of statistics for the country.

**161. Present position.**—The statistical service in India is admittedly poor and many basic data are not available, e.g., statistics of production, cost, value of the products, employment, the extent of unemployment, etc. The existing sources of statistical information bearing on industries are: (1) The Decennial Census of India, (2) "Large Industrial Establishments in India", published biennially, (3) Tables appended to the Annual Reports on the working of the Factories Act in different provinces, (4) Returns of Joint Stock Companies, (5) Monthly Statistics of Cotton Spinning and Weaving Mills in India, (6) Monthly Survey of Business Conditions in India and (8) Annual Reports of the Chief Inspector of Mines in India. There are moreover the following publications relating to trade and industry published by the Department of Commercial Intelligence and Statistics :—

- (1) Accounts relating to the Sea-borne Trade and Navigation of British India, published monthly as well as annually,
- (2) Annual Statement of the Sea-borne Trade of British India with the British Empire and Foreign Countries,
- (3) Raw Cotton Trade Statistics (Rail and River), and
- (4) Monthly Accounts relating to the Inland (Rail- and River-borne) Trade of India.

The commodities selected for specification in publications (1) and (2) and the details recorded therein are fairly comprehensive although the need for fuller information in respect of certain items which are grouped together is sometimes felt. These publications give the figures of imports and exports of India *via* the principal ports of Bengal, Madras, Bombay and Sind. They do not show the ultimate destination of the goods nor do they throw any light on the internal trade of a province. The statistics contained therein may be considered as satisfactory only from the all-India point of view but they require amplification to meet the needs of the provinces. No. (3) is issued monthly and shows imports and exports of raw cotton to and from different provinces. It would be more useful if the figures recorded were by trade classification of cotton. Publication No. (4) has been started with effect from the 1st April 1933 and the information given corresponds to similar information relating to the inland trade of India which was published by the Government of India up to the year 1922 when its publication was discontinued for reasons of economy. The trade statistics collected prior to 1922 used to be compiled from quarterly returns furnished by local Governments and they were published by the Government of India in a consolidated form in the annual publication entitled "Inland Trade (Rail- and River-borne Trade) of India". Annual Reports on Rail- and River-borne Traffic of their respective areas were also published by local Governments. The new monthly publication shows the figures of imports and exports of different provinces in respect of only 52 commodities, as compared with 127 in the old report, during each month together with running totals from the beginning of the official year. But the trends of trade of individual provinces in each commodity cannot be readily ascertained from it, nor is the internal trade movements of provinces given in it.

162. The question of the publication of fuller inland trade statistics regarding important manufactured and semi-manufactured goods produced in the country and raw materials consumed therein, along with figures of inter-provincial movements of these articles, was discussed at the Eighth Industries Conference held at Lucknow in December 1936 at the instance of the Punjab Government whose representatives suggested that as the matter was one of considerable importance to trade and industry, the Government of India should take the initiative by setting up a Committee to examine it. In 1937 a Committee was appointed by the Government of India to investigate the question of amplification of inland trade statistics. The report submitted by this Committee was considered at the Tenth Industries Conference held at Bombay in January 1939, and it was found that the Committee's proposals in this behalf, if given effect to, would involve an additional expenditure estimated at Rs. 4 lakhs per annum which the Government of India were unable to provide. Most Provincial Governments were also not willing to share the extra burden. The proposals could not therefore be given effect to. No further progress has since been made in the matter.

163. In other provinces the publication of the rail- and river-borne trade statistics was discontinued with the abolition of the all-India report with effect from the 1st April 1923. But the annual report on the rail-borne traffic of the Central Provinces and Berar continued to be published until the 1st April 1933 when it was also discontinued as a measure of economy. This report showed (a) the import and export trade of this province with other provinces, States and seaports in India and (b) the trade within the different trade blocks of this province in respect of some 127 articles. The annual cost on this account

at the time of its abolition was Rs. 22,000, as compared with Rs. 11,047, prior to the 1st April 1923 when these statistics were compiled under an all-India agreement. Information regarding movements of manufactured articles and raw materials as between the various territorial units of the country is equally valuable to industrialists and primary producers. One cannot, however, measure the value of such statistics by the extent to which they are regularly used, but rather by the information derived from them on the occasions when they are used. In view of the importance of these statistics to the development of trade and industry in the province, it is desirable that the publication of the annual report on the rail-borne traffic of the Central Provinces and Berar should be revived as early as possible.

164. The Government of India have a Department of Commercial Intelligence and Statistics in Calcutta, which, with its limited resources, has been issuing a number of useful statistical publications concerning trade and industry for some years past. A new Statistical Research branch of this department has recently been established at the Government of India headquarters. This is the only department in the country which collects and disseminates statistical data on a somewhat comprehensive scale. Most of the major provinces in India have also recognised the need for collection of industrial data. It is now admitted on all hands that one of the principal means by which Provincial Governments can help in the growth of industries and trade is to collect, compile and disseminate industrial and commercial intelligence. So far as is known special organisations for the purpose have already been set up in several provinces, *e.g.*, in Madras there is a Bureau of Commercial Intelligence and Statistics while Bengal has an Industrial Intelligence Section attached to the Department of Industries. In this province, however, no similar arrangements exist. Commercial and industrial enquiries from the public are dealt with by the "Commercial Agent", a minor official attached to the office of the Director of Industries. The nature of enquiries dealt with by him is referred to in the Annual Reports on the Working of the Department of Industries. The other duties entrusted to him are so heavy that he can hardly find time to collect information bearing on industries and trade. In view of the importance of industrial intelligence for the development of trade and industry, the setting up of special machinery for the purpose in this province is clearly indicated, as has already been proposed by the Director of Industries.

165. **Recommendations.**—The scheme of the Industrial Statistics Act, 1942, is comprehensive and, if enforced, should give valuable information. However, while considering draft rules simplification of forms should be aimed at, and duplication of work such as the collection of the same information by different departments should be avoided. For instance the bulk of the information relating to labour will be collected by the Factory labour and Mining departments, fuel consumption in licensed undertakings will be collected by the Electricity department. If these are not co-ordinated and the same principles of classification are not adopted, confusion and ambiguities are bound to arise. The one lacuna in the Act is in regard to the small-scale and cottage industries which are very important when considered in bulk and about which it is most difficult to collect information. With regard to these a quinquennial census has been suggested, but as we propose the creation of a permanent census department which would undertake investigation of specific problems as and when necessary, a separate quinquennial census of cottage industries would be superfluous.

166. One of the most fruitful sources of information is the decennial census. Unfortunately the scope of the census operations has been considerably curtailed in 1941 on account of pre-occupations due to the war. Modern ideas on the subject require more than a decennial census. It is felt that there is no special advantage in counting heads once in ten years on a fixed date. It is now widely accepted that the census should be a continuous process under a permanent Census Department staffed by trained specialists. If such an establishment is maintained there could be continual random samplings carried out on varied subjects and the results of such enquiries are so accurate that there is no need for complete enumeration. If trained staff could be engaged the scope of the census could be extended to include information about main and secondary employment, leisure, earnings, habits, health, diet, family budgets, cottage industries, etc. Many of the more advanced countries such as the United States of America, Canada, Australia, South Africa maintain efficient organisations for collecting demographical and vital as well as other statistics. The U. S. Bureau of Census is the principal statistical agency of the Federal Government. Enumeration is still decennial but the scope has been extended until the census has become a comprehensive inventory of the population and the resources and economic activities of the nation. The Dominion Bureau of Statistics of Canada has created a unified nation-wide statistical system the primary object of which is the correlation of statistics pertaining to several subjects and their commendation from a comprehensive national\* view-point. Australia has also devoted a great deal of attention to the foundation of a Federal Bureau of Statistics with the object of combining the work of the State and Federal statistical agencies and of securing a unified procedure as well as extension of the scope of enquiries.\* The possibilities of creating such a permanent department for India with branches in the provinces should be investigated and in view of the paucity of existing information this is a development greatly to be desired.

## CHAPTER XIV.—STATE AID TO INDUSTRIES

167. The question of state aid to industries has been discussed in paragraphs 293 to 302 of the Report of the Indian Industrial Commission and their recommendations are contained at page 286 of the Report. As a result of these recommendations State Aid to Industries Acts were promoted in provincial legislatures and the first province to pass such an Act was Madras in 1922. The C. P. Government Bill prepared on the lines of the Madras Act was passed finally in 1933. The Act was intended to give assistance to industries in the province partly financial and partly by the grant on favourable terms of land, raw materials, firewood, water, etc. The Act limits the amount of financial assistance to 50 per cent of the net value of the assets of the industry; and the concern which accepts financial assistance is required to mortgage its property to Government and make periodical returns and submit to periodical inspection. On the whole it cannot be said that the Act has been of very great assistance to industry nor has it been instrumental in promoting new industries to any great extent. The causes for this must be sought in the restrictive character of its provisions. But even with its provisions considerably liberalised, it is doubtful whether the State Aid to Industries Act can do much more than meet the financial requirements of

\* *A First Approach to the Problems of Industrializing India* by the Industrial Adviser to the Government of India.



cottage and small-scale industries. The financial problem of larger industries can only be solved through State-aided Industrial Banks or through some kind of National Development Corporation as suggested in the *Second Report on Reconstruction Planning*.

168. The best known instance of a province or State in India which has taken an active part in industrialising itself is Mysore and it may be of interest to describe their policy in this regard :

"In the absence of a co-ordinated policy for India as a whole, Mysore has had to evolve an individual policy of her own. This has proceeded in two directions, (1) encouragement and help to private effort and (2) direct Government enterprise in fields beyond the capacity of private effort. Government have themselves pioneered an industry whenever they thought that such a course was in the larger interests of the State and that private enterprise was not properly equipped to take it up. There are 13 large industrial concerns with a total fixed and working capital of about 320 lakhs which are completely owned and managed by Government, the chief among them being the Mysore Iron and Steel Works. Most of these industries are what are called basic or key industries. The policy of Government at the same time is not to encroach upon the field of private enterprise. When an industry pioneered by Government is successfully established it is handed over to private parties as in the case of the Premier Metal Factory and the Silk Filatures. Government have substantially aided industries by subscribing to the capital, by grant of land, and by supply of cheap power and water. Private enterprise has further been assisted by technical advice and by the grant of financial accommodation for the purchase and erection of machinery, construction of wells, mills ware-houses and other structures, for the purchase of raw materials and appliances and for working capital. The total loan thus sanctioned amounted to about 17 lakhs of rupees up to 1938-39. Facilities are also provided for the purchase of machinery on hire-purchase terms. As a result of this policy, there are now established as many as 29 major industrial concerns, (not including the Hydro-electric works, the textile mills and the Gold Mining Cos.), with a total capital investment of about 500 lakhs and employing 16,500 persons. The number of large industrial establishments in the State today employing ten or more persons is 605, employing 77,518 persons.

"51. The Mysore Iron and Steel Works, the Air-craft Factory, the Mysore Chemicals and Fertilisers, and Mysore Sugar Co., and the Mysore Paper Mills are the heavy industries which are directly owned or aided by the Government. The iron industry would not have come into being if it had been left to private enterprise. It passed through vicissitudes which would have broken any private company, however strong. It had to face the fire of public criticism which urged the closing down of the Works. But the Government pursued unflinchingly the part it had chosen for establishing this basic industry in the country and poured money into it, so that the capital invested now amounts to nearly three crores of rupees including about 87 lakhs that was written off. We are now reaping the benefits of this far-sighted policy. It has begun to yield a profit of more than 20 lakhs per annum, and what is more, it is capable of supplying the raw materials required by other supplementary industries like the manufacture of agricultural implements, machine tools, etc. Its value is inestimable during the period of the war. The Government have contributed 25 lakhs of rupees to the Air-craft Factory and it has contributed not only to the war effort but to the solution of the

problem of unemployment and has afforded the technical training so necessary to our young men educated and uneducated alike. In the medium scale industries again, Government have invested nearly 50 lakhs in Government concerns and own shares to the value of another five lakhs. These yield a net profit of about a lakh and a half rupees per annum.”\*

169. On the subject of the policy of the State towards industries, the Madras Government are, to the best of our knowledge, the first Provincial Government to make a pronouncement. It is contained in the following communiqué:—

“The Government have, in consultation with the Provincial Post-War Reconstruction Committee on Industries, re-examined the question of the nature and extent of the financial aid, control, management and advice that should be provided by the Government for existing as well as new industries in the Province. The existing State Aid to Industries Act provides comprehensively for help by Government but it has not been availed of by the public to any considerable extent. It has, therefore, been considered necessary to state the policy which the Government propose actively to pursue towards industries. Industries will be divided into four classes: (1) Those wholly financed, controlled and managed by Government; (2) those in which the Government will take a majority of the shares but will allow private management, where necessary; (3) important industries in which Government will take a fraction of the shares and will also have representation on the Directorate, and (4) private enterprises in which Government will give the necessary help, advice as well as technical and other assistance.

“The classification of the industries will be made by the Provincial Post-War Reconstruction Committee on Industries. This committee will either by itself or through its sub-committees and, with the aid of technical experts, where necessary, get schemes made for industries of classes (1) and (2). It will also get skeleton schemes made for classes (3) and make them available to intending industrialists.

“Applications for assistance should be made to the Director of Industries and Commerce who will, in the case of industries of classes (2) and (3), report to the Government after enquiry. The Government will take action in consultation with the Provincial Post-War Reconstruction Committee or its sub-committees. The Government have constituted sub-committees to deal with industries connected with the following subjects: Textiles, Mines, Machinery and machine tools, Chemicals, Agriculture. The sub-committees will have power to co-opt additional non-officials.”

170. We are in general agreement with these proposals but have not had the time for a classification of industries into the categories specified. We may however indicate in general terms that in our view electricity and public utilities should be State concerns, as also such key industries as the nitrogen industries. In the second class we would put for the present iron and steel and the tanneries proposed. In the third class we have placed the porcelain and insulator industry and the agricultural implements factory. The classification will eventually be decided by Government on the recommendation of the panels concerned who in turn will consult the Provincial Post-War Reconstruction Committees on Industries. We are strongly of opinion that one such Committee should be constituted for this province

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\* *Mysore Census, 1941: Industry in Mysore, by the Census Superintendent in Mysore, 1942, page 25.*

immediately and the same duties entrusted to it as are assigned to their Committee by the Madras Government in the communiqué reproduced above.

171. One way of participating in industry would be for Government to give land, or buildings, rights to raw materials, etc., instead of buying shares for cash.

172. As for the rest, much valuable guidance has been furnished in the *Second Report on Reconstruction Planning* under the heads "VIII.—Industrial Development and IX.—Finance". In particular it says: "Various measures can be adopted by the Central Government to assist and encourage the promotion of private industry. This may include—

- (i) Scientific and industrial research;
- (ii) Planning and technical enquiries undertaken in conjunction with the representatives of industry;
- (iii) Geological and mining surveys;
- (iv) The provision of facilities for training technical staff in both subordinate and higher grades, including, where necessary, training overseas;
- (v) Obtaining of technical experts from overseas;
- (vi) Allocation of priorities for machinery;
- (vii) Provision of power and transport facilities;
- (viii) Finance, either direct, or through some kind of National Development Corporation in which the public can participate;
- (ix) Organisation of internal and external markets, e.g., through an Indian Export Corporation;
- (x) Tariffs or other means of safeguarding industries;
- (xi) Statistics and commercial information."

Most of these subjects have been dealt with in the various chapters of this report and we are confident that everything possible will be done under each of them.

173. It is only necessary for us here to add brief comments on certain miscellaneous problems.

The greatest aid which the State can render to industry is by financing research liberally. A great deal more than has been done in the past can be done in this direction in India both by the Central and Provincial Governments. It may be mentioned in passing that the University Grants Committee of England has recently recommended the doubling of the grants for research. The subject will come in for more detailed treatment in the chapter on Technical Education and Research. We understand that at present the amount spent by an industry on industrial research carried on by the industry is exempt from taxation. We would recommend that Government should consider favourably the question of extending this principle to include donations to universities and recognised research institutions.

174. Fears have been expressed in some quarters that immediately after the war, if not indeed before its termination, Britain and the U. S. A. will dump manufactured goods in India and kill our industries. This matter has been dealt with in the *Second Report* (see pages 23 and 24) in which a permanent Tariff Board has been promised. To clear any lingering doubts, the Hon'ble Member for Development and Planning in his reply to the address by the Chairman of the Central Provinces and Berar Chamber of Commerce, said at Nagpur on January 18, 1945, that he was "in a position to give on behalf of the Government of India an unqualified and unrestricted assurance, that adequate protection would be given to Indian industries against foreign dumping."

175. As regards the allied problem of foreign firms opening manufacturing establishments in India, the so-called "(India) Ltds.", to share in the advantages of Indian protection and at the same time to compete on unequal terms with purely Indian enterprise, the Government of India are fully alive to this problem. In the Imperial Legislative Council, speaking on the resolution which led to the appointment of the Indian Industrial Commission, Sir William Clark, then Member for Commerce, said: "The building up of industries where the capital, control and management should be in the hands of Indians, is the special object which we all have in view", and he deprecated the taking of any steps "which might merely mean that the manufacturer who now competes with you from a distance would transfer his activities to India and compete with you within your own boundaries." The *Second Report on Reconstruction Planning* says, on page 10:

"When Government decides to enlist the assistance of firms from overseas to develop industries of a highly technical kind, or those which depend on patents, the following principles may be observed:

"In such cases, the participation of outside interests may, if possible, be confined to the provision of technical assistance and of machinery and experts, the firm being remunerated for services rendered and by royalties on patents. In cases where participation in capital is required, care should be taken to see that the capital is issued in India, that the majority of the capital, as well as the directorate, is Indian and final control over policy rests in Indian hands. In cases where it is necessary to entrust the management of such industries to outside firms, provision should be made for the training of Indians in all the technical processes and the ultimate transfer of control to Indian management."

176. The feeling against "(India) Ltds.", branches of foreign firms established in India is partly due to the fact that their attitude has largely been unhelpful in the matter of employing Indians as apprentices and in more responsible positions. What the Paper Mills told the Tariff Board is fairly typical of this attitude:

"The explanation of the mills", said the Tariff Board,\* "is that there is great difficulty in securing the right type of Indian because of the fact that the work of paper making is arduous and makes considerable demands on the stamina and endurance of the young men engaged on it so that most of them do not remain to complete the period of apprenticeship. In the course of the Tariff Board's enquiries, covering a wide range of industries having essentially different characteristics, this argument has been adopted so frequently by employers that we are unable to accept it as a convincing explanation. The truth is that the inherent incapacity of educated Indian youths for industrial jobs is an assumption which is too readily resorted to by the less progressive class of employers in India as an excuse for a policy of inertia and undue conservatism. We have seen Indian apprentices at work in the mills we have visited, and have been favourably impressed by their bearing and general attitude. Indeed, the mills themselves have expressed strong approval of the Indian apprentices who are at present in the mills."

Sir Ardeshir Dalal also said that Government would see that development of industries by foreign companies in India did not proceed in a manner contrary to Indian interests.

\**Report of the Tariff Board on Paper, 1931, page 102.*

**177. Weights and Measures.**—If there is one circumstance which impedes the progress of trade and industry in this country more than another, it is the absence of a uniform system of weights and measures. No country can call itself civilised until it has this desideratum. There is of course Provincial legislation on the subject, but it is more honoured in the breach than the observance because it is largely left to the municipalities and local bodies to enforce it or not. We feel that this is far too important a matter to be left to the discretion of local bodies. There should be compelling all-India legislation with no discretion left to local bodies or others, making it absolutely obligatory on every one to use the standard weights and measures prescribed; whether it is the metric system or any other, may be left for detailed consideration.

**178. Labour.**—Section 25 at page 55 of the Second Report deals with the many problems regarding labour which the Government of India have under consideration. A Fact Finding Committee on urban labour has actually been sitting for over a year and it is understood that its work is only the prelude to a regular Commission of Enquiry. We therefore do not consider it necessary to say very much on this subject, although we realise that efficient and contented labour is vital to industry.

A thorough overhaul of our labour code is necessary to ensure that labour throughout the country has a fair deal, viz., fair conditions of work, minimum wages reasonable in the conditions of the country and a fair chance of having its point of view discussed with those in authority.

It is essential to secure improvement in the industrial relations between employers and workers, particularly in this province, where they have not of late been satisfactory. Some legislative machinery should be devised for the conciliation of industrial disputes and we trust that this will be done without delay.

We would reiterate what we said before that while improving labour conditions generally, it is necessary also to rationalise labour and improve its efficiency.

**179. Standardisation and adulteration.**—Industry in India has suffered more from the absence of standardisation of industrial products and adulteration of the raw products than almost anything else. Adulteration in every branch has become a most lucrative trade. For instance, the importer prefers our oil-seeds in the raw condition to oil as the latter is very impure. The Second Report has stressed the importance of preventing the adulteration of articles of food and drink.\* It is equally important to prevent it in the industrial line and we therefore suggest that Central legislation should be enacted and enforced aiming at standardisation of industrial products and preventing of malpractices such as adulteration, etc.

**180.** The Government of India have evolved a rough plan showing how they intend to finance reconstruction and development. The distribution of Central assistance will be roughly on a *per capita* basis, but additional help to backward areas is a part of the scheme. In view of the undoubted fact that the Central Provinces has lagged behind many other areas, we recommend that the Provincial Government should represent to the Government of India the need for a much larger grant to this province than its population figures justify.

**181.** One last point we might refer to. As the scope of Governmental activity will be very much enlarged by the implementation of

the measures recommended by us as also those under the consideration of Government, we endorse the view put forward by some eminent publicists that the Government of India should constitute what is called an Economic Civil Service—i.e., a service consisting of officers who have been trained to study and solve industrial and economic questions.\* A beginning is already made in this direction by the creation of what is known as the Finance and Commerce Departments Pool in the Central Government.

The state of things which we visualise is not unlike that conjured up by the authors of the Bombay plan to explain which they quote the following passage from Professor Pigou's book on *Socialism versus Capitalism* :

"If, then, it were in the writer's power to direct his country's destiny, he would accept, for the time being, the general structure of capitalism; but he would modify it gradually. He would use the weapon of graduated death duties and graduated income-tax, not merely as instruments of revenue, but with the deliberate purpose of diminishing the glaring inequalities of fortune and opportunity which deface our present civilization. He would take a leaf from the book of Soviet Russia and remember that the most important investment of all is investment in the health, intelligence and character of the people. To advocate 'economy' in this field would, under his government, be a criminal offence. All industries affected with a public interest, or capable of wielding monopoly power, he would subject at least to public supervision and control. Some of them, certainly the manufacture of armaments, probably the coal industry, possibly the railways, he would nationalise, not, of course, on the pattern of the Post Office, but through public boards or commissions. The Bank of England he would make in name—what is already in effect—a public institution; with instructions to use its power to mitigate, so far as may be, violent fluctuations in industry and employment. If all went well, further steps towards nationalisation of important industries would be taken by degrees. In controlling and developing these nationalised industries, the Central Government would inevitably need to 'plan' an appropriate allocation for a large part of the country's annual investment in new capital. When these things had been accomplished, the writer would consider his period of office at an end, and would surrender the reins of government. In his political testament he would recommend his successor also to follow the path of gradualness—to mould and transform, not violently to uproot; but he would add, in large capitals, a final sentence, that gradualness implies action, and is not a polite name of standing still."†

## CHAPTER XV.—TRANSPORT

**182.** Pages 27 to 32 of the *Second Report on Reconstruction Planning* contain the Government of India's tentative proposals for the reorganisation and development of the transport system of the country. As regards roads and road transport, it is observed that a good system of communications, including road communications, is necessary for the proper development of the country, industrially, commercially and culturally. The Technical Committee on Roads and Road Transport has made comprehensive recommendations regarding post-war policy and these are being examined by the Government of India in consultation with provinces and States.

**183. Road Transport.**—So long as the Railways had a predominant voice in the transport policy of the country, the road system was not allowed to develop in the way in which it should have; for instance,

\* *A Plan for the Economic Development of India, (The Bombay Plan), part II, page 33.*

† *Ibid, page 35.*

no roads parallel to the railway line were allowed to be constructed, save in exceptional circumstances; neither were road bridges on rivers ordinarily allowed where there was a railway bridge. This has since changed to an appreciable extent; with the abolition of company management of railways a more national policy is being gradually adopted. Rail-road co-ordination is now given much greater prominence than formerly.

184. Road communications within the province are generally satisfactory from the industrial point of view, except in the Chanda and Balaghat districts and Chhattisgarh generally. These districts are capable of considerable industrial development but large areas are either isolated from the rest of the province during the monsoon or are ill-equipped with road and railway communications. It is understood, however, that the Provincial Post-War Road Programme includes new roads and bridges which should meet the industrial requirements of this area. We trust that this area will receive suitable priority while considering the needs of the different parts of the province.

185. **The Central Provinces Government's Post-War Road Programme.**—We have been informed that the Provincial Post-War Road Programme was originally estimated to cost roughly Rs. 7.25 crores, inclusive of national highways. Out of this something like Rs. 25 lakhs were to have been spent on cement-concreting roughly 66 miles of national highways passing through towns, while about Rs. one crore was to have been spent on black-topping 1,222 miles of other roads. We have been told that this programme is under revision and when revised will cost roughly Rs. 27 crores. As has already been stated in Chapter V, we consider that cement should be given undoubted preference over asphalt in the construction of roads. We were informed by the Chief Engineer, Public Works Department, Central Provinces, that cement, though more expensive, is better in the long run than asphalt. Apart from the fact that the province is a large producer of cement, the cement-surfaced roads will stand the climatic conditions of the province better than asphalted roads. Further points in favour of cement concrete are resistance to abrasion, and a non-skid surface. The black-topping of roads frequently melts in the hot weather and gives way under heavy traffic and is not recommended.

186. In regard to the construction of bridges we agree with the observation made in the Second Report that "in order to prevent duplication and waste of public money and in the interests of public service, existing railway bridges might be decked to cater for road traffic and new bridges should be combined road and rail bridges wherever required or possible". This valuable suggestion should be given full effect to, even if it involves some re-alignment of the roads concerned, as it might result in substantial saving. The following railway bridges should, in our opinion, be so decked:—

(1) The bridge on the Nerbudda at Moretakka.—A separate road bridge is being considered. This, in our opinion, should not be necessary if the existing bridge is decked.

(2) The bridge over the Erai river, three miles north-west of Chanda.

(3) The bridge over the Wardha river between Majri and Wun.—The decking of this bridge may require re-alignment of the Warora-Wun road *via* Majri. But this we consider worthwhile.

(4) The narrow gauge bridge between Brahmपुरi and Warsa-gunj on the Wainganga.—Warsa is a fast-growing market and as it is

on the outskirts of an important aboriginal area in the Chanda district noted for its forest produce it is desirable to connect it with Nagpur as well by road.

(5) The broad gauge bridge over the Wardha river near Ballarshah on the Ballarshah-Kazipet line.—This road bridge, if constructed, will connect the Central Provinces and the north of India with Hyderabad and South India, and is to be preferred to the proposed road bridges on the Wardha at Pohna and on the Penganga at Patan Bori now apparently contemplated.

(6) The narrow gauge bridge over the Purna river between Daryapur and Murtizapur.—This may also involve the re-alignment of the existing road to some extent.

(7) The broad gauge bridge over the Mahanadi near Arang.

**187. Bullock carts.**—Although "from the earliest times there is record of roads and wheeled vehicles in India,"\* the progress made by the bullock cart has not been remarkable. Whatever improvements may be made in the field of transport, there is no doubt that the bullock cart will, for a long time to come, play an important part in the transport of the country. The carts in use in this province are of crude design and construction. Some have very narrow iron tyres and as a rule the bearings allow the wheels considerable lateral play. The result is that the wheels move sinuously on the road surface and cut it up badly. The fast-moving pneumatic-tyred motor vehicles which follow suck up the disintegrated material leaving the road full of pot-holes. In the interest of the preservation of the road surface and making the carts themselves more efficient, improvements are called for. The pneumatic-tyred vehicle has been suggested for adoption but this is bound to be costly especially as these carts are only used during the season and at other times the capital is blocked up while the rubber perishes in storage. Also the pneumatic tyres and ball bearings will continually call for maintenance which is altogether beyond the village technical resources. The solution would be to use machined bearings with no side play and fairly wide steel tyres, say, 2½" wide.

Another point worth mentioning is not so widely known. It is that the diameter of the wheel has a profound influence on the draught power required. Six-foot diameter wheels are suggested for adoption. A crude roller bearing may also be successful.

**188. Rail Transport.**—The province is served by two Railways, the Great Indian Peninsula and the Bengal-Nagpur Railways. The Great Indian Peninsula Railway provides a broad gauge system, with a small length of narrow gauge serving the Murtizapur-Ellichpur, Murtizapur-Yeotmal and Pulgaon-Arvi Sections. The Bengal-Nagpur Railway has a large mileage of both broad gauge and narrow gauge systems. The desirability of eventually having one uniform gauge for the whole of India thus doing away with the inconvenience, delay and expense consequent on the existence of three gauges should be explored. The route mileage of rail transport at present available is sufficient to meet the present requirements of the province. With the establishment of new industries, however, it may be necessary to extend the railway systems, but in the absence of more accurate data, we consider it would be premature to make any definite recommendations in this respect, except that, as and when the need arises, the railways should meet the essential requirements of industry and be prepared to provide the necessary extensions. We would only make one suggestion and that is that a broad gauge line directly connecting Jubbulpore and Nagpur is overdue and may be taken up without delay.

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\*Report of the Indian Roads Development Committee, 1927-28, page 3.



189. It has, however, been represented to us that the provision of railway sidings to serve factories is difficult to obtain from the railway authorities and even when provided, is costly. The evidence before us indicates that assisted sidings are provided by the railways on the principle that the major portion, if not the entire cost, of the provision of the siding and its working, should be borne by the industries. This, we consider, is too stringent a condition. Apart from the facility which a siding provides to the factories, a liberal policy in regard to the provision of railway sidings leads to the establishment and development of industries and, thereby, to increased traffic to the railway. Therefore, the benefit from the provision of sidings is derived not only by the industries themselves but also by the railways in the shape of increased revenue from freight charges. There would, therefore, appear to be a case for giving more liberal terms for industrial sidings and we recommend that the Railway policy in this respect should be directed to this end.

190. We have received a number of complaints that the rates policy followed by the railways serving this province has militated against the establishment of industries in this area. The question of railway rates is a problem of a specialised nature, requiring a wide range of detailed and technical knowledge for its proper understanding and for its efficient treatment. At the same time, it is of overwhelming importance, especially for industries. It has been admitted that the location, development and expansion of industries in any area are vitally affected, not only by the transport facilities available, but also by the rates policy adopted by the transport agencies serving them. Even tariff concessions of a substantial nature may be offset by an adverse rates policy adopted by the transport agencies. It has not been possible, within the short time at our disposal, to give this important matter the detailed attention necessary. Our observations on this subject are, therefore, based on broad considerations and do not contain the details which can be worked out after a more detailed survey.

191. Originally, the Indian railways followed the policy of encouraging the movement of raw products towards the ports for export and of imported articles from the ports upcountry.\* Gradually such traffic increased and justified itself on the principle that the cost of haulage of large volumes of traffic is lower than that of shorter movements. This policy had the unintended effect of encouraging the establishment of industries at or near the ports, which largely explains why Bombay and Calcutta have become big industrial centres although, from the point of view of the economic welfare of the country as a whole, such large industrial concentrations are not desirable.

192. This policy has affected the Central Provinces and Berar adversely in common with other inland provinces. The rates policy planned to encourage movements to and from the ports resulted in raw products, which abound in this province, finding their way towards the ports, both for export outside the country and for consumption by industries locally, in preference to their consumption by industries within the province, near the source of the raw produce. Although this may not explain completely the industrial backwardness of the province, we feel that this is an important point.

193. The general feeling now is that the tendency for industries to be concentrated in certain areas, notably Bombay and Calcutta, noticeable for some years, should be discouraged, that the industrial development of the country should be viewed

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\*Report of *The Indian Fiscal Commission*, 1921-22, paragraph 127.

as a whole and that industries should be encouraged to establish themselves at centres where their location would be justified by economic and national considerations. In the circumstances, the problem of transport rate assumes still greater importance. Although as a result of the recommendations of the Fiscal Commission\* the railway rates policy has undergone appreciable change and it is no longer the accepted policy to give low rates for traffic to and from the ports, still the fact that industries had already established themselves at or near the ports and had favourable rates quoted for them, has made it obligatory on the Railways to continue these low rates. The old state of affairs thus continues to some extent unaltered, but with the progressive establishment of industries in the interior in accordance with the principle of industrial regionalisation we consider that all movements of raw products and finished goods inside the country should receive the same consideration in regard to freight rate assistance from the railways as the ports have received hitherto. In the beginning, to enable industries to establish themselves in "economic" centres in the interior in competition with the established industries in the ports, it may be necessary to offer them still lower rates for a short period on the policy of fostering infant industries. Such period would be necessarily short and it seems desirable that this assistance should be rendered.

194. This province should ordinarily be in a very favourable position on account of its geographical location, if our industries obtained consideration in freight charges on the principle indicated. Centrally situated as it is, its industries have the advantage of shorter leads for raw materials and lesser distances to consuming centres for the finished products. Thus given the same rates, the incidence of total freight on raw and finished products should operate in our favour. We would however like to make it clear that it is not our intention that the railways should lose revenue with a view to subsidising industries. With increased industrialisation, the railways will not be called upon to give up any part of their present revenue, rather the rationalisation of the rates as proposed would help to place their revenues on a sound footing and will in the long run be more paying.

195. Another direction in which there is need for change in the railway rates policy is in regard to the comparative freight rates for raw products and for finished goods. Instances have been brought to our notice where it is cheaper to send raw produce to any particular market than processed products; for example, it is cheaper to transport oil seeds to Bombay than oil or oil cake. We, therefore, consider that there is need for a change in the policy which would lead to our raw produce being utilised by local industry to a much larger extent than hitherto, thus removing the handicap so far imposed upon it by railway rates policy.

196. The complaints which we have received indicate also that although the policy has been accented that export should not be the criterion for deciding the rates policy of railways, local industries do not get the same consideration to which they would appear to be entitled. This, we consider, is due partly to the inability of the industries to understand the difficult "art of Railway-Rate-making" and their consequent inability to present their case satisfactorily. This is a defect which can be remedied by giving the industries expert advice on this technical matter. We consider, therefore, that an organisation should be set up to give industries advice on the problem of freight rates. This can best be done by the Chamber of Commerce, who should provide trained staff for the purpose.

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\**Ibid.*, paragraphs 128 to 141.

197. If, for any reason, any industry is unable to obtain satisfaction in regard to freight costs, provision at present exists for the aggrieved persons to bring the case up before the Railway Rates Advisory Committee for redress. We understand that this facility is very rarely made use of by the industries, possibly because they are unaware of it. If the railways would appreciate the difficulties involved and adopt a more considerate attitude towards local attempts to establish industries at centres justified by economic and national considerations, we expect that it would be possible for a working policy to be formulated, which would be in the interests at once of railways, trade and industry.

198. The system of levying charges over individual railways separately instead of on the through distance is detrimental to the interests of this province particularly, served as it is by two railway systems. Movements within the province over contiguous railways or inter-provincial movements in regard to traffic originating from one railway and passing over another, have to pay charges based on the distances over individual railway systems. On the other hand, if charges on through distances were adopted, freight rates would be lower, even on the existing basis. Apart from the assistance which it will give to industries, it appears reasonable that charges for similar distances under similar conditions should be the same, and the mere accident of being served by two railway systems is no justification for an increase in the total charge. We realise that this involves a matter of policy of railway-rating in general, but whatever may have been the justification in the past for treating each railway system as a separate entity for rating purposes, we feel that this anomaly should no longer be allowed to exist, now that practically all the railways have been taken over by the State.

199. Recommendations.—We, therefore, recommend—

(a) that the requirements for additional railway communication which may be required on account of the development of industries should be viewed sympathetically as and when the need is felt; that a direct broad gauge line be constructed from Nagpur to Jubbulpore;

(b) that the conditions for the provision of railway sidings for industries should be relaxed and the incidence of cost to the industry should be reduced;

(c) that the freight rate for the movement of raw and finished products should be on the same basis as for industries situated in and around the ports; if a still lower rate is required in certain cases for a short period, this should be arranged;

(d) that an organisation should be set up to give expert assistance and advice to industries in respect of freight costs; and

(e) charges should be levied on the through distance instead of on each railway system separately.

200. Water Transport.—The Industrial Commission wrote: "We feel justified, however in urging that the Government of India should take up the question of improving existing waterways as we cannot help thinking that, in the absence of a representative specially charged with their interests, the vested interests of railways have prevented waterways in India from receiving the attention which has been given to them in other large countries with such satisfactory results." In this province, at any rate, the railways have had nothing to do with the stagnation in the water transport position. The only rivers in the province which could be made navigable, as far as we have been able to ascertain, are the Godavari, which forms the southern boundary of this province for a short distance and the Nerbudda. We make no

apology for reproducing the following extract from the *Chanda District Gazetteer* which makes interesting reading. It explains the history of the Godavari Navigation Scheme and how after a considerable expenditure of labour and money all further work was stopped in 1871-72 :—

“The Godavari navigation works.—No account of the communications of the district would be complete without some reference to the Godavari navigation scheme. The Godavari, the Pranhita and the Wardha rivers would all be practicable for navigation as far inland as the falls of the last-named river were it not for the existence of three long stretches of rocky shoals usually known as the barriers. The First Barrier begins at a point about 132 miles above Cocanada, and is situated without the limits of this district. Sixty-eight miles of free water lie between the head of this barrier and the foot of the Second or Enchampalli Barrier, which begins at the junction of the Indravati and Godavari rivers and stretches down stream for 14 miles. Seventy-five miles of navigable stream then intervene until the foot of the Third or Dewalmari Barrier (so-called from the place of that name in the Ahiri Zamindari), which again interposes a bar to navigation for a stretch of 35 miles. Another 101 miles of clear fairway are obtained above the head of this barrier, and then near Soit in the Warora tahsil a sheet of limestone stretches from bank to bank of the Wardha and marks the point above which the river ceases to be practicable to navigation except for small boats. To overcome these obstacles by a series of anicuts and canals was the central idea of the Godavari Navigation Scheme. This task successfully performed, it was considered that the whole length of the river would be rendered passable to vessels or flats with a draught of from 3 to 6 feet for six or seven months during the rains and early cold weather, and to smaller vessels for eight or nine months. The idea even seems to have been mooted of negotiating the falls of the Wardha, and thus making the river practicable as far as Hinganghat. The scheme in its entirety was not confined to the main rivers, but embraced various affluents, such as the Indravati, Penganga, Wainganga, Sevari and Tal. The first person to press the project on the attention of Government was Colonel Arthur Cotton, who drew attention to the subject in 1849, and in 1853 drew up a preliminary scheme of operations which was not, however, sanctioned. In 1855 Lieutenant Goddard made an expedition as far upstream as Chanda and this was followed by another expedition which was, according to the instructions of Government, to be ‘one chiefly of exploration and investigation’ and was conducted by Lieutenant Haig. As a result of this expedition, it was reported to Government that at a cost of 30 lakhs 473 miles of the main stream could be rendered navigable for three-quarters of the year, and that at a proportionately increased cost altogether 873 miles of river, including affluents, could be similarly thrown open. Even then, however, Government hesitated to commit itself to any step involving the actual incention of work on the barriers, and investigations continued until, in 1863, a detailed report was submitted on the whole circumstances of the river and the country on its banks, which embodied proposals for building anicuts and canals with locks at each barrier, for the clearance of detached rocks in the fairway, for the construction of groins in shoaly parts, and for the laying down of tawning-paths the whole estimated expenditure being placed at a minimum of 75 lakhs of rupees. The Government accepted these proposals as far as they related to the First and Second Barriers, and work on the former

commenced in 1865-66. Later on, the veto on the operations at the Third Barrier was withdrawn, but as a matter of fact no work worth mentioning was done on this barrier, although a road was constructed from Chanda to Devalmarri in the anticipation that the river would be made navigable to that point. In 1868-69, the work at the First Barrier was completed, but the Second Barrier, on which work was commenced in 1867, proved more difficult to negotiate, and matters never seem to have progressed satisfactorily in relation to it. Climate, want of labour, want of funds have all been assigned as the cause for this unsatisfactory state of things, but whatever the true reason, the fact remains that the work was abandoned under the orders of Government in 1871-72 after some progress had been made on the aricut, locks and guard walls. Since that date, nothing beyond ordinary repairs has been done on these works, and above the Second Barrier traffic on the river is practically confined to the floating of timber. Altogether 62.80 lakhs were sunk in the operations, and their practically total failure, as far as this district is concerned, is a somewhat melancholy page of history."\*

We are strongly of opinion that this matter should be reopened and the possibilities of making the river navigable fully investigated. At the present moment a good deal of traffic passes between Tallagudem which is six miles from the Central Provinces frontier, Rajahmundry and Cocanada, a total distance of above 200 miles. By completing this scheme, the Central Provinces will have access to the sea and its effect on the trade and industrial possibilities of the province is incalculable, Cocanada is a roadstead for cargo boats and small craft carrying passengers to Burma, Singapore, etc. Water transport is considerably cheaper than other forms of transport and we, therefore, consider that the navigation scheme of the Godavari and Wardha rivers and their affluents should be given high priority in the post-war transport schemes of the province. It will also develop the Chanda district which suffers more from neglect than any other district in this province, and for all that we have done for it, it might as well not belong to this province.

In the *Chanda District Gazetteer* there are many references to the navigability of rivers taken no doubt from old records. Chanda is 643 feet above sea level and Sironcha only 406 feet. The Godavari flows from Sironcha to Cocanada some 250 miles, the drop being 406 feet to the sea level. In 1871, sleepers and scantlings required for the construction of the Bilaspur-Katni Railway, from the Allapalli forests were floated up the Pranhita, Wardha and Kanhan rivers up to Kamptee.

The Wainganga is navigable from Bagh in the Balaghat district down to Garchiroli in the Chanda district, but between Garchiroli and Chinchgondi there are barriers which make navigation difficult. But after Chinchgondi the river again becomes easy to navigate. "Soon after entering the Chanda district the Wardha river is opposed at Soit by a sheet of limestone stretching from bank to bank over which it dashes in a waterfall of some size and considerable beauty. Below this point the river flows peacefully and is well fitted for navigation, especially after its junction at Wardha near Chanda with Painganga which doubles its flow until just before its confluence with Wainganga where it meets a mighty upheaval of gneiss and granite which extends across the river and is known as the Third Barrier. Here the river wanders through a tangle of rock and bushes in a thousand streams and rapids quite impassable to boat traffic. The Godavari Navigation Scheme of the sixties included the excavation of a channel through this

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\**Chanda District Gazetteer*, paragraph 224, pages 257-259.

barrier, but this part of the project was abandoned in its most initial stage and the river has consequently never been used except to float up a certain amount of timber from the Allapalli forests. Major Lucie Smith also mentions a Government steamer of 40 tons as plying in his day, but this has long ago disappeared in the limbo of things forgotten."

The only other reference to the navigability of rivers in the province is in the *Hoshangabad District Gazetteer* where it has been stated that in 1833 there was a plan to make the Nerbudda river navigable within the limits of the district as the drop in level was only about three feet per mile. We are of opinion that this matter should also be taken up for investigation.

**201. Air Transport.**—We consider that the province should take full advantage of the fact that Nagpur is an important centre in the national airways system and that Government should see that the aerodromes which have been built in the province are maintained and improved in peacetime and that a sufficient number of the youth of the province get training in aeronautical engineering. Air transport gives access to places which are difficult for rail or road transport.

## CHAPTER XVI.—LOCATION OF INDUSTRY\*

**202.** Countries like England which have allowed industries to develop uncontrolled are now regretting it. This unregulated development has led in England to very large concentrations of industrial population which are a menace to the health and beauty of the country. Things had reached such a critical stage that a Royal Commission had to be appointed to advise on the distribution of Industrial Population under the chairmanship of Sir Montague Barlow and they have submitted a most interesting and instructive report which countries like India, on the threshold of large-scale industrialisation, would do well to study in order to avoid the mistakes committed by other countries. The Commission unanimously adopted nine principles, the most important of which was that the problems before them were so urgent and important that they could only be solved by a Central Authority on national lines. The Commission which attached great importance to the maintenance of the freedom to private enterprise was forced to the conclusion that large-scale industrial concentrations were fraught with danger to the health and well-being of the community and that definite action should be taken by Government to disperse such concentrations and gave wide powers of regulation of industrial location to the National Industrial Board which they proposed. Large-scale industrial concentrations are a feature of all advanced countries. In India the principal concentrations are to be found in the ports and commercial centres, like Bombay and Calcutta, Ahmedabad and Cawnpore. The ports are big railway termini and enjoy special transport facilities owing to the earlier Railway policy of favouring traffic to and from the ports. The distribution of industrial activity in India is extremely uneven. In 1939 as many as 52 per cent of the factory workers were found in two provinces, Bengal and Bombay. On account of the changed Railway policy and other circumstances, the predominance of the ports is gradually diminishing. Some of the towns, which are beehives of industry, are also the most fertile breeding ground of poverty and disease and display the same undesirable features as large industrial cities in the west, such as slums, noise, smoke, etc. India should prevent a repetition of these evils which have attended industrialisa-

\*For much in this Chapter we are indebted to the publication, *Location of Industry*, prepared by the Office of the Economic Adviser to the Government of India.

tion in the west. This is possible only by taking well-concerted action on national lines to prevent the unregulated growth of large accretions of industrial population. The advantages and disadvantages of large concentrations of industrial population have been summarised by the Barlow Commission.\* The advantages are proximity to market, reduction of transport costs and availability of supply of suitable labour and the more serious disadvantages are the heavy charges on account of high site values, loss of time through street traffic, congestion in the very large towns, the risk of adverse effects on efficiency and output of the long journeys which the workpeople have to make daily and the risk of hostile attack by air in time of war. The Indian Industrial Commission in paragraph 274 of their report have also referred to the serious labour difficulties created by the concentration of industries in certain cities and recommended measures calculated to "diffuse and decentralise industries and thereby increase the availability, the comfort and the efficiency of labour". On balancing all the considerations it is clearly in the public interest to spread industries throughout the country thus promoting a more even distribution of economic welfare.

Conditions in India are favourable to dispersal of industry; the country is vast and industrial products have to travel over long distances to reach the consumer, the raw materials are widely scattered over the country, and there is an ample labour supply.

It is therefore satisfactory to note that the Government of India are planning to see that industrial development is as far as possible evenly distributed throughout the country.

"The location of Industry," says the Second Report, "must primarily depend on convenient access to power, raw materials, transport facilities and markets but, subject to this condition, industry should, wherever possible, be located in rural areas or small towns where expansion is easy and labour can be obtained in close proximity to its village of origin. The creation of a large industrial population divorced from its villages of origin and living in squalor in large cities is at all costs to be avoided.

Industrial Development must not be confined mainly to a few Provinces and States but so far as conditions permit should be extended in a rational manner over the whole of India. Particular attention shall be given to those parts of India which are industrially undeveloped and every assistance given towards the establishment of industries in such areas. Industries depending on agricultural raw materials must be linked up with Agriculture and their location decided after due consideration of the availability of the raw material, facilities for transport, availability of power and the proximity of the market."†

The decentralisation of industry so proposed will incidentally solve to some extent another of India's great problems, viz., excessive ruralisation and too great dependence on land and draw off some at least of the surplus population from the villages. How excessive this ruralisation is will be realised when it is stated that in 1941 only 16 per cent of the people of India lived in towns with a population of over 5,000, while in Great Britain the corresponding percentage was 80. Apart from the generally healthy effect urbanisation has on national character and efficiency, the provision of social services, such as, education, medical, recreation and improvement in sanitation and lighting, which we would like to see provided in the countryside, are easily possible only in towns.

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\*Report of the Royal Commission on Distribution of Industrial population in England, Part IV. †Second Report on Reconstruction Planning, page 5.

**203. The claim of the Central Provinces to a place in the scheme of industrialisation.**—The claims of this province for a share in any all-India scheme of regionalisation of industry are strong. They are briefly—

- (1) Its central geographical position. Nagpur is the heart centre of India from which radiate a network of road and rail communications bringing the province within easy reach of most other provinces.
- (2) The existence of a large labour population and reasonable rates of wages.
- (3) Considerable amount of agricultural and forest wealth, such as cotton, oil-seeds, timber, bamboo, tanning materials, etc.
- (4) Vast mineral resources, such as coal, iron, manganese, bauxite, clays, etc.
- (5) The central situation of the province far from the coast is a matter of considerable strategic value to the country for in the case of war, industries in the Central Provinces would be least exposed to hostile attack.

In the previous chapters we have set out in some detail the prospects of several industries and it would therefore be sufficient to indicate here briefly that in any regional scheme of industrialisation, it would be difficult to set aside the claims of this province to have the following industries established within its borders:—

- (1) Textiles, (2) Oil, vegetable ghee, soap and allied products, (3) Paper, (4) Tanning and leather, (5) Pottery and glass, (6) Iron and steel, and (7) Alumina and aluminium.

In view of risks of air attacks in modern warfare, it may be considered advisable to have certain types of factories—especially those making munitions—built underground. Now-a-days the question of natural light and air has lost much of its importance, since such establishments can be air-conditioned and provided with the latest type of artificial lighting. Moreover, during the summer weather in the Central Provinces, underground factories are less exposed to glare and heat. Even from the technical point of view, location underground has its advantages and it is a well-known fact that the fine muslins of Dacca were made in cellars below the ground, as such location ensures a certain amount of moisture which is helpful to good weaving. After the war there will be opportunities for studying Germany's layout of underground industries which are said to be on the most scientific and up-to-date lines.

**204.** If the principle of control by the State of industrial location is accepted, then the question of town planning will immediately arise, for it would obviously be undesirable to allow industries to spring up anywhere in the locality allotted to them. Of town planning, however, we have very little in this province and indeed in India. A town Improvement Trust has no doubt been in existence in Nagpur for some eight years but the progress made is so little that a new comer to Nagpur driving in the city would not be able to say that an Improvement Trust has been at work improving the city. In mentioning this, it is not our intention to blame anybody for the extremely slow progress made. We are aware that many circumstances have contributed to this unfortunate result. We are also aware that efforts of late have been made to speed up the work. But we are convinced that unless town planning is taken up in all seriousness, not only in Nagpur but also in localities where industries are likely to develop, the conditions which exist today in Nagpur and in the larger towns of India



and other countries would be reproduced throughout the province. We are informed that the Hyderabad State has made considerable progress with town planning and has even laid out one or two industrial towns on the latest principles. What is possible in Hyderabad should also be possible in this province. The one advantage that flows from not having planned our towns so far is that we could produce the pattern we desire. Now therefore is the time for action. Every town of any size should have its own plan. That this is not merely fanciful can be seen from the fact that Italy empowered towns with a population of 10,000 and over to make plans of development and reconstruction so long ago as 1865. Similarly, in Sweden the Planning Law of 1874 provided that for every town there shall be a plan of development.

We therefore recommend that a Town Planning Department should be created and placed in charge of a Town Planning Engineer with suitable staff, and that a plan be prepared for the development of every town with a population of over 20,000. We are further of opinion that no development should be allowed in these towns which does not conform to the plan.

## CHAPTER XVII.—TECHNICAL EDUCATION AND RESEARCH

205. **General education.**—One of the most distressing features of Indian life is that only about 12 per cent of the people in British India can read and write. It is a matter of surprise that after nearly 80 years of educational endeavour no more than 11.7 per cent of the total population of the Central Provinces and Berar should be literate. The number of literate women is only 4.6 per cent and no province with such an overwhelming proportion of its women illiterate can achieve anything remarkable either in the industrial or any other sphere. It is only in this sense that the question of elementary, or to use the word now generally accepted, basic, education becomes relevant in an industrial survey. Out of some 40,000 villages in the province, only some 10 per cent have primary schools and some 40 per cent have schools within easy reach of them. The remaining 60 per cent are beyond the reach of the elements of education.

Assuming that the number of children of school-going age between 6 and 11 forms 15 per cent of the total population, the number of children in school is only 14.2 per cent of the total number of children of that age-group. On the same basis, 24.8 per cent of boys and only 3.6 per cent of girls of school-going age are actually in school. It is obvious that the provision for primary education is utterly insufficient to meet the requirements of the province, as educational facilities simply do not exist for 9.5 lakh boys and 12 lakh girls. The report of the Bureau of Education for the year 1937-38 indicates that the position in this respect is much worse in this province than in many other provinces in the country as can be seen from the following statement :—

Province	Number of schools for		Total	No. of schools per 100 sq. miles of the area	No. of schools per lakh of the population
	Boys	Girls			
Madras ..	39,411	4,725	44,136	34	89
Bombay ..	11,751	1,493	13,244	17	64
Bengal ..	43,355	16,719	60,074	78	100
U. P. ..	18,275	1,868	20,173	19	37
Assam ..	6,295	851	7,146	13	70
Orissa ..	7,147	429	7,576	23	87
C. P. ..	4,397	491	4,888	5	29

The reports of the Education Department indicate that the standard of education at the primary stage is low which is attributed in a large measure to ill-qualified teachers whose emoluments are exiguous and whose conditions of service are depressing.

**206. The present state of technical education.**—Technical education in this province is insufficient and inadequately organised to meet the requirements of the future. The need for bold and effective planning is nowhere more urgent than in the educational field, and more particularly in the field of technical education for, in the words of the Second Report, "there is at present a very great shortage of trained personnel and further development work is bound to be held up unless arrangements are made immediately to take up the question of increasing to a very considerable extent the output of trained personnel".\*

The Laxminarayan Institute of Technology, Nagpur, which unfortunately can only admit Hindu students domiciled in the province, provides post-graduate courses of two years' duration in chemical technology and chemical engineering leading up to the degree of B. Sc. (Tech.) of the Nagpur University. The annual output of the Institute is 16 graduates. Facilities also exist for industrial research.

The Government Engineering School at Nagpur provides instruction in civil and mechanical engineering of the standard suited to overseers and workshop foremen and shift-engineers. In normal times, the School also trained a certain number of automobile mechanics and oil-engine drivers. The maximum output of the School is 30 civil overseers, 15 foremen mechanics, 10 automobile mechanics and 5 oil-engine drivers. The School has since been considerably expanded to train war technicians.

In addition there are fifteen industrial schools which aim at producing trained artisans. In the schools at Jubbulpore and Akola, instruction in some of the cottage industries is also provided. The annual output of these schools is approximately 200 and includes, as indicated in the returns for the year 1940-41, 80 carpenters, 52 blacksmiths and 67 boys trained as tailors, carpet- and durrie-makers, toy-makers and workers in cane. Entrants usually possess the primary school certificate and the courses provided are of three years' duration, but the training imparted does not answer to the specific requirements of any of the known categories of technicians required by modern industries.

If we leave out of account the Laxminarayan Technological Institute, which was established in 1942, there is hardly any provision worth mentioning for industrial research and the training of engineers and technicians. What this province therefore needs is "a national grid of technical education which will carry a constant flow of power into industry and commerce".

**207. The post-war plan of the Central Advisory Board of Education.**—The utter insufficiency of general and technical education in the country has been the subject of persistent popular criticism and it is refreshing to note that the Central Advisory Board of Education has produced a comprehensive scheme of education, both general and technical, under which all children will spend eight years at school, i.e., between the ages of 6 and 14. This is what is called basic education and is meant for all. Then provision is made for high school education of about six years' duration to one out of every five pupils at the age of 11 who will be diverted at that stage into the high school

\*Second Report on Reconstruction Planning, page 40.

from the basic school. Two main types of high schools are distinguished :—

- (a) the academic, for such pupils as exhibit a bent for literary education, and
- (b) the technical, for those, not necessarily less able, but with a flair for the practical.

It is assumed that one out of every fifteen pupils passing out of the high school will go to the University. These would ordinarily take a degree in arts or science after three years. Lastly there will be those, particularly gifted, necessarily small in number, who will take to research. Besides this main line of general education, the Central Advisory Board of Education visualise the following types of technical institutions for the various types and grades of workers required by industry :—

(i) The Junior Technical or Trade School.—The object of the school will be to prepare skilled craftsmen. It is estimated that about 4 per cent of boys passing out of the senior basic school will receive about three years' training in these schools to qualify as skilled workers in various branches of industry.

(ii) The Senior Technical Institute or Polytechnic.—The object of the senior technical institute will be to provide technical training for a superior type of technician of the foremen or supervisors grade. The minimum qualification for entrance into these institutes will be the matriculation standard and it is estimated that about 12 per cent of the boys passing out of the high schools will join these schools. The senior technical institutes will, in many cases, be polytechnical institutes and provide whole-time and part-time instruction in a wide range of trades and industries. They will provide a whole-time three-year course for the diploma followed by a two-year advance course for an advanced diploma. They will also provide part-time courses for advanced certificates and for such other training as particular industries may demand.

(iii) Technological departments of the University.—The training of superior executives and research workers will be undertaken by the technological departments of the University. It is calculated that approximately 4 per cent of the pupils passing out of the high schools will enter the technological departments of the University where they will receive courses of varying duration in various technological subjects. The University will also provide facilities for scientific and industrial research.

## 208. The urgency of providing general and technical education.

—We agree generally with the plan of education prepared by the Central Advisory Board of Education, except that we feel that the period of forty years suggested by them is much too long for the realisation of the modest goal set before the country. We know that the advanced countries of today have not always been in the front rank of progress and it was not by slow and cautious steps that they attained their present position. Bold and unorthodox measures, such as those adopted by Japan and Russia, are essential to enable this country to forge its way to the front position among the nations of the world. This view is shared by some official and non-official members of the Central Advisory Board itself. For example, the Education Ministers of Bengal\* and Assam† observed in their dissenting minute that "the speed of progress envisaged in the report must at least be doubled, if not quadrupled, no matter even if we have to resort to means and

\*Mr. Tamizuddin Khan.

†Khan Bahadur Maulvi Sayidur Rahman.

methods, as Russia did on emancipation from the Czarist regime",\* and the late Sir Meverel Statham, Director of Public Instruction, Madras, and the Education Minister of Sind† also expressed similar views. It is of course realised that dearth of teachers will constitute a veritable bottle-neck which will retard progress but this bottle-neck will have to be got over because the need for speedy progress is nowhere more urgent than in the field of education. Sir Frederick Nicholson in his note on Japan for the Indian Industrial Commission wrote: "The leap at education which the whole nation has made under the compulsory system of education is shown by the fact that while the primary school system was only formulated in 1872, by 1873 the number at these schools had already reached 28 per cent, by 1883, 51, by 1893, 59, and 1904, 93 per cent of the children of the school-going age." In Russia the percentage of illiteracy in the year 1913 was 78. By the year 1927-28, it was reduced to 44 and by the year 1935, it was further reduced to 8. In the period 1931-43, the number of pupils in the primary schools in Russia increased by 2.7 million or by 125.5 per cent, in incomplete secondary schools by 1.6 million or 307 per cent, and in secondary schools by 150,000 or 307 per cent. Surely, if those countries can progress at such speed, there is no reason why this country should move at a phenomenally slow pace. We must shed our timidity and hesitancy. It will be necessary to utilise all our resources to accelerate progress and if, for example it is found necessary to prescribe that every matriculate and graduate should teach for a year or two before he gets the certificate or diploma, the intelligentsia of the country will be found ready to do their duty. An essential part of the scheme, in our opinion, would be the payment of suitable stipends to these pupil teachers. The need for compulsion in social matters is being realised even in so conservative a country as England. In a recent report on the Curricula and Examinations in Secondary Schools by a committee of the English Board of Education, presided over by Sir Cyril Norwood, ex-Provost of Eton, the following significant recommendation was made:—

"From an educational point of view the value of the service which boys and girls of eighteen are now giving to the country can be seen, even on the partial assessment now possible, to be very great. If, after the war, some form of public service were to be required, we can foresee similar educational values resulting from a period of six months given by boys and girls drawn from varying circumstances of life to work of national importance in industry and agriculture, at sea, in the social services and in similar fields no less than in the armed forces. Such a period so spent might do much to fuse the country into a single whole with a common purpose and a common understanding. For these reasons we have left room for a period of 6 months free from examinations."

It will be necessary greatly to speed up the training of technicians of all kinds and grades. The training of technicians will no doubt take account of the development of industries but our industrial future itself will depend to a very large extent upon an adequate supply of technicians. The vicious circle involved has been well described by Mr. Abbott in the following words:—

"No country can initiate and carry on industries on a large scale, unless it has an adequate supply of men specially trained for the direction and management of large industrial concerns as

\* *Post-War Educational Development in India*, Report of the Central Advisory Board of Education, page 104.

† Pir Ilahi Baksh.

well as of others qualified for the minor but very important supervisory posts in them. On the other hand, it cannot be expected that capable and ambitious men will devote themselves to acquiring this special knowledge and skill unless they see a reasonable prospect of exercising it and gaining a decent livelihood thereby."

The development of technical education in Russia within a brief period is remarkable and the following table\* compares the state of affairs before the revolution with that in subsequent years:—

Type of institution	1915	1928	1931	1932	1933
<b>Number of higher education and higher technical—</b>					
Institutes ..	91	129	537	721	721
Students ..	124,700	159,800	272,100	469,800	469,800
<b>†Technicums—</b>					
Institutes ..	233	1,650	2,932	3,096	3,522
Students ..	48,000	253,600	593,700	754,100	797,000
<b>Factory apprentice schools and kindred types—</b>					
Institutes ..	2,644	1,814	3,265	3,970	3,900
Students ..	219,000	178,300	584,700	975,000	958,900
<b>‡Rabfacs—</b>					
Institutes ..	..	147	694	872	926
Students ..	..	49,200	231,900	319,500	352,700
<b>§Communist higher education institutions and higher education agricultural institutions—</b>					
Institutes ..	..	19	49	53	76
Students ..	..	8,400	18,900	30,500	31,000
<b>Communist Party Schools—</b>					
Institutes ..	..	100	108	163	230
Students ..	..	17,000	23,800	33,600	40,000

209. Besides providing an efficient and adequate system of technical education, it will be necessary to provide generous facilities for scientific and industrial research. The importance of research is well understood in advanced countries where not only the State but private industrial concerns spend vast sums on research. The Second Report gives some interesting figures:—

"The amount spent by 566 British firms on research and development in 1938 was £5.44 million (about Rs. 7 crores). The pre-war research expenditure in the British universities was £7 million and that in the American universities was 70 million (or Rs. 93 crores). In addition, Government Departments in both these countries were directly responsible for the conduct and subsidy of research on behalf of their Governments. Compared with these figures, the expenditure of India on research and development is very small. Although it will not be possible for India to spend money on the scale of the more advanced countries,

\*Taken from "*Changing Man....The Soviet Education System*", by Beatrice King.

†Intermediate centres of professional training.

‡Or "Workers faculties" providing courses of instruction for illiterate adult factory workers.

§Higher type of educational institutions for adult workers who have passed out of Technicums or Rabfacs. There is nothing specially communistic about them.

it is obvious that very large sums will have to be made available for such research and development as are considered essential for post-war development."\*

It is also of interest to review the position in respect of research made in Russia in the brief period between 1929 and 1933 which is indicated in the table below :—

	1929	1930	1931	1932	†1933
Research Institutes	.. 400	520	850	940	840
Branches	.. 41	102	267	303	188
Number of Scientific workers	.. 22,600	31,600	42,200	53,000	47,900
Number of Post-graduates	.. 1,000	2,600	6,400	7,900	6,400

We are glad to note that the Government of India have themselves appointed a committee under the presidency of Sir R. K. Shanmukham Chetti to suggest ways and means of reorganising scientific and industrial research in India and we feel sure that valuable results will flow from their recommendations. It may also be recalled that the Government of India have established, or are shortly going to establish, the following research institutes :—

- (1) a Silicate and Glass Research Institute at Calcutta;
- (2) a National Physical Laboratory;
- (3) a National Chemical Laboratory;
- (4) a National Metallurgical Laboratory; and
- (5) a Fuel Research Institute.

One omission from this list is an Oil Research Institute. Considering that India is the biggest oil-seeds producing country in the world and that the Central Provinces is an important oil-seeds producing province we are of opinion that a properly-equipped National Oil-seeds Research Institute should be established as soon after the war as possible, preferably at Nagpur.

210. In the initial stages it will be necessary to rely on foreign experts to help to organise industries and for the training of personnel. We are not unaware that there is a general prejudice against the employment of foreigners generally, but if care is taken that only competent men are engaged, and then only for specified pieces of work and for specified periods, there should be no objection. This point of view has been forcibly put by Mr. H. P. Gibbs, General Manager of the Tata Hydro-Electric Supply Company, in his evidence before the Indian Industrial Commission: "No man should be imported into India", he said, "unless he is a recognised expert in his particular line. He too should be engaged on short-time contract and made to understand he is being engaged and paid to teach our local men just as much as to introduce and carry on his work. The young man from abroad, who is educated but inexperienced, should not be brought to India and allowed to get his practice here."

Fortunately there is no fear that the supply of technical experts from foreign countries will in any way be stinted. There is reason to think that the more advanced countries will be willing to co-operate with us in developing our industries and providing technical assistance. Sir George Nelson, retiring President of the Federation of the British Industries and Head of the English Electric Commission now in India, stated in an interview to the London representative of *The Hindu*, "India's vital problems are well known

\*Second Report on Reconstruction Planning, page 57.

†Decrease in 1933 is due to reorganisation, and to dismissal of insufficiently qualified workers and post-graduates. "*Changing Man....The Soviet Education System*", by Beatrice King.

to us. We are anxious to help in their solution . . . Great Britain has great resources in scientific development, technical knowledge and manufacturing experience. We must, therefore, in our mutual interests, get together so that the vast power resources can be developed and machinery installed to advance India's industrial development and it will be found that there are many manufacturers in this country anxious to give India the benefit of their technical knowledge and experience". Professor A. V. Hill, F.R.S., has already pointed the way, "to a new and fruitful field of co-operation between India and Great Britain for the benefit of both." Commenting on the suggestions made in his report on the organisation of scientific research in India, the *Manchester Guardian* observed, "Professor Hill has shewn beyond dispute that a large vacuum remains to be filled in the field of scientific and industrial research" and added that "as a result of the war, India has become a creditor country, which means that she may make claims on the goods and services of the outside world and specially sterling countries, without having to devote any corresponding resources to export. Some Indians are worried that we might not allow them to claim goods and services against financial claims of the war period. Soon enough they will find that the real difficulty lies in making room for our goods and services in India".

**211. Recommendations.**—We assume that the Provincial Government will accept the scheme of the Central Advisory Board of Education, commonly known as the Sargent Scheme, as the basis of their educational reconstruction, with such modifications as may appear to be necessary. We trust that these modifications will be in the direction of expediting the completion of the scheme within a time considerably less than the forty years suggested by the authors of the scheme. With this background we proceed to make our recommendations. The criticism most commonly advanced against the Indian system of education is that it "was at the outset mainly intended to provide for the administrative needs of the country and encouraged literary and philosophic studies to the neglect of those of a more practical character".\* With the adoption of the Sargent Scheme, this criticism will largely disappear.

**Junior Technical Schools.**—We recommend the opening of one junior technical or trade school in each tahsil of the province within the first five years after the war, if possible. We are of opinion that the training provided in these institutions should be in conformity with the needs of the industries of the province as a whole and should cater for such of the following subjects as are most suited to the locality concerned :—

(1) Engineering occupations.—Fitters, machinists, turners, electricians, masons, black-smiths, tin-smiths, moulders, engine-drivers, boiler-attendants, power-house attendants, automobile drivers, welding, metal trades.

(2) Agriculture and allied occupations.—Vocations based on forest, agricultural or animal produce, carpentry, bee-keeping, dairy-farming, baking and confectionery, fruit-canning, manufacture of preserves and milk products, tanning, leather, and shoe-making.

(3) Textiles and allied occupations.—Vocations connected with textiles and cellulose industries, spinning, weaving, blanket-making, hosiery, printing on cloth, tailoring, cutting, wooden goods making.

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\*Report of the Indian Industrial Commission, paragraph 135.

(4) Occupations connected with mineral products.—Vocations based on minerals, mining, pottery, porcelain and glass.

(5) Others.—Lacquer work, toy-making, musical instrument making, radio repairing, manufacture of sports goods, etc.

**212. Technical High Schools.**—We recognise the importance and the possibilities of the new type of technical high school suggested and recommend that all existing Government high schools should, within the first five years after the war, be provided with technical departments and those managers of private high schools, who agree to open technical departments in their schools, should be encouraged to do so and assisted by liberal grants. The schools at Chhindwara and Chanda should, in addition to other subjects, teach mining. Unless a sufficient number of technical high schools are established, there will not be that steady flow of pupils into the proposed senior technical institutes and the technological departments of the university which alone will keep the latter fully occupied.

**213. Senior Polytechnics.**—As regards the senior technical institute or rather the senior polytechnical institute, of the pattern proposed by the Central Advisory Board of Education, we consider that there should be four of them in the province, one each at Nagpur, Jubbulpore, Amraoti and Raipur. Of these, we propose that those at Jubbulpore and Nagpur should be opened immediately. The existing Government Engineering School at Nagpur should, we consider, be converted and expanded into a good senior polytechnical institute. It will at the same time be an important centre for reconditioning war-returned technicians. The training in the senior technical institutes will be essentially practical, the object being to produce the subordinate executives, the chergaman and foreman type of men, the non-commissioned officers of the great industrial army.

Training will be provided in these institutes on the following, among other, subjects:—

- (a) mechanical engineering and motive power,
- (b) electrical engineering,
- (c) civil engineering,
- (d) chemical engineering,
- (e) chemical technology (with special reference to fuels, coal distillation, heavy chemicals, electro-chemical industries, ceramics and paper),
- (f) textile technology, and
- (g) mining and metallurgy.

**Technological Department of the University for the training of senior executives.**—Now provision remains to be made for senior executives, like directors and managers of the highest grades and for those who pursue academic studies, professors, research scholars and the like. For this purpose, we consider that, if for financial or other reasons a separate College of Technology cannot be established, the existing College of Science should be converted and expanded into a College of Science and Technology. At the present time, not only does our education suffer from an unduly literary bias at the bottom, but there is also complete divorce between academic studies and practical training at higher levels. We believe that the proposal to teach both under the same roof with a system of common lectures, wherever possible, will do nothing but good to both types



of student. This enlarged college will provide instruction and training at the highest level in all branches of Science and Technology including the following :—

(a) *Science*

Mathematics.  
Physics.  
Chemistry.  
Geology.  
Biology, etc.

(b) *Technology*

- I. Engineering—
  - (a) Civil and Sanitary.
  - (b) Mechanical.
  - (c) Electrical.
  - (d) Chemical
  - (e) Radio.
- II. Chemical Technology.
- III. Textile Technology.
- IV. Mining and Metallurgy, etc.

Fully-equipped workshops, laboratories and other equipment necessary for the technological courses will be provided in the Technological Department. For further practical training pupils will be sent for specified periods to manufacturing works by special arrangement.

**214. Scholarships at home and abroad.**—The existing provision of scholarships for Central Provinces students tenable in technical institutions in the other provinces of India is insufficient. We suggest that it be considerably enlarged, as shown below :—

Subject	No. of scholar- ships	Amount of scho- larship Rs.	Institution
Electrical Engineering	5	75	Indian Institute of Science Bangalore.
Engineering, Civil	6	50	Benares University.
Mining	5	50	Dhanbad.
Mining	6	50	Benares University.
Metallurgy	4	50	Benares University.
Textiles	10	50	Victoria Jubilee Technical Institute and Bombay Uni- versity College of Techno- logy, Bombay.
Chemical Technology and Chemical Engineering.	6	75	Laxminarayan Institute of Technology, Nagpur.
Chemical Engineering	4	75	Indian Institute of Science, Bangalore.

Similarly, promising graduates should be sent abroad to institutions in England, U. S. A. and elsewhere, for higher training in technical subjects. The Government of India have recently instituted a scheme by which large numbers of students and others are given scholarships tenable at foreign universities and institutions for higher technological training. The following suggestions are made for the award of scholarships to promising young men for training abroad in view of the urgent requirements of industrial development of the province :—

Subject of training	No. of persons	Remarks
General training in Chemical factories	6	England and America.*
General training in Engineering concerns.	3	Do.*
Fertilisers	2	
Generation of Electricity—		
Thermal	2	America.
Hydro-Electric	2	Do.
Aeronautical Engineering	2	Do.

\*Preference should be given to persons engaged in teaching science or technology and to the technical personnel of the Industries Department.

Subject of training	No. of persons	Remarks
Oil Milling of cotton seed and allied industries.	2	America.
Aluminium and Alumina ..	2	Canada and U. S. A.
Rayon ..	2	America.
Paper manufacture ..	2	Canada and Sweden.
Forest Utilisation ..	2	U. S. A.
Coal distillation ..	2	
Plastics (with particular reference to vegetable protein plastics).	2	
Cottage Industries and village education.	2	China.
Lacquers, varnishes and paints ..	2	
Ceramic Industries ..	2	
Textiles ..	2	
Design and fabrication of chemical machinery.	2	Massachusetts Institute of Technology
Glass manufacture ..	2	
Tannery practice ..	2	
Fruit preservation and fruit juices ..	2	
Total ..	47	

We should like to mention that in our view, professors and lecturers teaching in our colleges should also be encouraged to take these scholarships.

**215. Scientific and Industrial Research.**—We regard generous provision for research in the province as a matter of supreme importance. A provincial organisation for planning, directing, co-ordinating and assisting research in the province and for establishing close *liaison* between research and industry is necessary. A body, which, with suitable modifications, could be entrusted with these functions, has been in existence since April 1941. It is the "Industrial and Scientific Research Committee" consisting of three officials, three technical members, three representatives of industries and one general representative under the presidency of the Financial Adviser to the Governor. It has examined a number of schemes and approved all of them but in the absence of any funds at its disposal, none of the schemes have been implemented except one which is being financed by the Government of India. We consider that the functions of this Committee should be enlarged as suggested above, and adequate funds placed at its disposal in order to enable it to discharge those functions effectively. The proposed College of Technology will have ample facilities for post-graduate studies and research. We are also of opinion that every college in the province teaching science should also be equipped for research both in pure and applied science. The staff engaged in research should be provided with such leisure, facilities and assistance as may be found necessary. The creation of a number of research fellowships and research studentships in all colleges teaching science is essential to the industrial progress of the province. Planned and well-directed research in the following subjects should, in our view, be initiated as soon as possible:—

(1) Coal.—Utilisation of non-coking Central Provinces coals, blending tests, de-ashing, low and high temperature carbonisation, complete gasification.

(2) Bauxite.—Isolation of titanium oxide from bauxite for pigments, activation of bauxite.

(3) Manganese.—Production of ferro-manganese, and other manganese alloys and chemicals.

(4) Iron Ore.—Production of iron and steel using non-coking coals and producer gas.

(5) Oil Seeds.—Processing of oil seeds for various purposes like oil fabrics and utilisation of oil cake for manufacture of plastics, etc.

(6) Shellac.—Use of shellac for lacquers, varnishes and plastics.

(7) Rice Husk and Saw Dust, etc.—Manufacture of furfural, oxalates, strawboard, etc.

(8) Ceramics.—Suitability of the ceramic materials of the Central Provinces for the manufacture of porcelain, glass, enamelware, etc.

(9) Cotton linters.—Production of rayon.

(10) Oranges.—Canning and bottling of juices, preparation of jams, marmalades, candied peel, etc.

(11) Artificial silk.

(12) Nitro-cellulose and varnishes.

In so far as a target can be fixed in a matter of this kind, we suggest that the aim should be to have some 200 research workers engaged simultaneously in the various institutions of the province by the end of five years.

216. All measures necessary to secure a sufficient supply of teachers and professors for all kinds of technical schools, institutes and colleges should be initiated as early as possible. In particular, special attention should be paid to the reconditioning of war-returned technicians for civil employment. We have already made proposals for absorbing some 1,200 war technicians in peripatetic parties engaged in village uplift and the improvement of rural industry. There will still be two to three thousand men to be provided for. These technicians would have received an intensive training in one craft or other for a period of eight to twelve months in one of the Technical Training Centres and would have had additional experience in the maintenance and repair of such complicated machines like tanks, guns, aeroplanes, armoured vehicles, etc. It is, therefore, likely that they will have developed mechanical ability of a fairly high order. There appears to be a misconception among the general public that these technicians are in some way inferior to the old time craftsmen who went through a leisurely five years' apprenticeship. This war has exploded many myths and one of them is the myth that craftsmen cannot be produced by short intensive training. One has to remember that the ordnance factories, munition works, and industries the world over, are today manned by men and women who have gone through a short intensive training only. If this be possible in war, why should not peacetime industry be manned by such people? Another charge against them is their training is one-sided, meaning thereby that a man knows only one trade and no more. It is not understood why, for instance, a fitter should know carpentry or a machinist should know moulding and so on. On the other hand, operatives so trained are essential for modern mass production methods, where one man for one job is the rule. All that is necessary is to provide a six months' training for these technicians in training centres to make them fit for civil industry.

The supply of trained personnel for the supervisory grades is a more difficult problem. These are generally drawn from those trained in the senior Technical Schools or Polytechnics and these institutions are not likely to send out their first batch of students till some three years after the war; some other method, therefore, has to be devised for training a large number of such persons in as short a time as possible. A certain number of war-returned technicians

will have the requisite qualifications for supervisory posts, but the number of such people, this province can hope to get, will be very small. To meet immediate post-war requirements, we suggest that in the Nagpur and Jubbulpore senior technical institutes which, we have recommended, should be established immediately, there should be run side by side with the normal course extending over three or four years, short-term courses of, say, nine to twelve months' duration. The better educated and better class of technician, especially those who showed leadership and initiative in the field, should be drafted to these short-term courses in large numbers. The syllabuses for these courses should be arranged to give an intensive training in engineering and scientific fundamentals, drawing, mathematics, etc. All practical work and works training can be cut out as these technicians would have already had three or four years' practical experience to their credit.

Besides these, early steps should be taken to import experts from foreign countries who will assist in organising technological departments of colleges, technical institutes and technical schools of various types. The import of such men should be for a short period and they should be entrusted with the task of setting the machinery of schools, institutes and colleges in motion and training the personnel that will run them in future.

**217. Adult education.**—The report of the Central Board of Education recognises the need for adult education. Adult education is particularly necessary for the illiterate industrial operative who is the backbone of industry. If Indian labour is inefficient, it is chiefly due to the prevailing illiteracy. We therefore strongly recommend that steps should immediately be taken to promote adult education as suggested in the Sargent Report, particularly for the workers engaged in industries.

**218.** Finally, we recommend that a team of selected persons should be sent out to England, America and Russia to study the work of planning in the different branches of social services and economic activities, particularly industry. This measure we consider essential and one for immediate adoption, because the necessity of technical knowledge of planning in various fields of social activity is so urgent that it cannot be postponed without detriment to the national interests.

## CHAPTER XVIII.—SUMMARY OF RECOMMENDATIONS

### CHAPTER I.—INTRODUCTORY

### CHAPTER II.—HISTORICAL

### CHAPTER III.—NEED FOR PLANNING

(1) The Agriculture Department should be adequately staffed and ample provision for research made.

(2) The need for planning is extremely urgent and in no department is it more so than in that of industrialisation.

### CHAPTER IV.—ELECTRICITY AND POWER

(3) A survey should immediately be made of the hydro-electric possibilities of the province and special attention paid to the Chhat-tisgarh Division.

(4) The State should own and operate the electric supply projects proposed.

(5) For the purpose of electrification, the province should be treated as one unit, divided, for convenience, into five zones, each with a thermal scheme: Nagpur, Katni, Drug-Raipur, Chhindwara and Chanda.

(6) When the hydro-electric schemes have been constructed, they should be connected up with the thermal stations to form one single provincial grid, linked up in turn with the all-India grid system.

(7) The thermal stations should be located as near as possible to the coal mines; these coal mines should preferably be worked by the State: if they have already been leased out to private parties, the leases should be terminated on payment of compensation.

(8) Electric power should be sold to industrial consumers at a rate not higher than that at which they can themselves generate it and, in special cases, even at a lower rate.

(9) Immediate start should be made with the thermal stations in the Nagpur, Katni, Chhindwara and Drug-Raipur areas.

(10) Rural areas within the reach of the electric grid should be electrified as in Mysore.

(11) Other areas should be gradually provided with small thermal stations, which may ultimately be connected up with the provincial grid.

#### CHAPTER V.—MINERALS

(12) A detailed survey of economic geology of the province should be undertaken immediately and completed within ten years and the necessary staff should be recruited, if necessary, from abroad. The Government of India should enlarge the Geological Survey of India and lend the services of officers to the Provincial Government.

(13) The Nagpur University should institute degree courses in geology, mining and metallurgy with the necessary practical training.

(14) The development of minerals of strategic and key industrial importance, *viz.*, coal, iron and steel, manganese, bauxite and the industries connected with them should be controlled by the Central Government in consultation with the Provincial Government.

(15) Coal mining in the province should be rationalised by electrification and the more general use of machinery. The coking coals of Bihar should be reserved for metallurgical purposes and the inferior C. P. coals used for steaming.

(16) Research should be undertaken in the better utilisation of the C. P. coals, particularly the conversion of non-coking into coking coals.

(17) Iron and Steel.—Encouragement should be given to the expansion of the iron and steel industry wherever there are facilities for it as in the C. P.

(18) The discovery of coking coal in the Mahanadi and of partially coking coal in the Pench Valley areas may make it possible to establish a steel industry in the province.

(19) The possibility of adopting the Krupp-Renn process for the direct manufacture of steel should be explored.

(20) The Provincial Government should negotiate with the Government of India for the early construction of the Bastar Hydro-electric Regional Scheme and claim its share of power, when it becomes available.

(21) The iron and steel industry should be promoted by private enterprise with State planning and State participation to the extent of one half the capital.

(22) Manganese.—Manganese being a rare and vital mineral of strategic value which is being fast depleted and the exploitation of which has become a virtual monopoly of the C. P. Manganese Co., it is desirable that Government should terminate all manganese mining leases on payment of compensation, and carefully control further mining in order to conserve it for national purposes. Whether the State should work the mines itself or through agents is a matter for consideration. Government should utilise export as a bargaining counter for reciprocal advantages.

(23) As regards other minerals, the royalties due to the State should be revised with a view to securing a legitimate share of the profits to the State.

(24) When reasonably cheap electric power becomes available, the prospects of manufacturing ferro-manganese and other alloys should be investigated.

(25) Bauxite.—The establishment of the aluminium industry in the province should receive every encouragement and the construction of the hydro-electric scheme in the Rewa State which is likely to supply electricity to this industry at an economic rate should receive high priority.

(26) Salvage aluminium should be used for new purposes like railway-coach-building and not be dumped on the market to depress it.

(27) Alumina.—A plant to produce 20 tons per day of calcined alumina and 10 tons of hydrate should be started near Katni.

(28) A 10-ton factory for the manufacture of alum should also be started in the Katni area.

(29) A titania recovery works should be established in connection with the alumina refinery.

(30) Aluminium.—A reduction plant to produce 10 tons of the metal should be established near Katni.

(31) Unfair foreign competition should be met by adequate protection.

(32) There is justification for an aluminium cable works.

(33) All the above industries are best promoted by private enterprise.

(34) Cement.—Decentralisation of factories to avoid heavy transport charges to markets and for other reasons is justifiable.

(35) The industry should be undertaken by private enterprise.

(36) Local cement should be used in preference to foreign asphalt for making roads.

(37) Calcium carbide, etc.—Investigation should be undertaken if limestone suitable for the manufacture of calcium carbide is available near Katni.

(38) A survey should be made to discover asbestos deposits and research should be undertaken to produce alternative building materials.

(39) There is scope for the manufacture of high grade insulators, etc., from steatite deposits in the province. The processing of steatite for use in the paper, rubber, textile, paint, and other industries should be investigated.

## CHAPTER VI.—CERAMICS AND GLASS

(40) Porcelain.—A factory to manufacture porcelainware and insulators should be located in Chanda, Nagpur or Jubbulpore.

(41) Refractories.—A factory at Katni of the minimum capacity of 50 tons a day, run by private capital, a survey of ceramic raw materials and research in processing them and protection against foreign competition are also recommended.

(42) Tiles.—A survey of raw materials is necessary. There is scope for several medium-sized tile works to be run by private capital with technical assistance from Government.

(43) Glass.—Existing factories should be remodelled, expanded, and made upto date. Technical advice from Government and the Silicate and Glass Research Institute contemplated by the Government of India should be made available to the industry. An experienced glass-blower should be imported from abroad on a short-term contract.

Survey of raw materials and protection to the industry are also recommended.

## CHAPTER VII.—TEXTILE INDUSTRY

## Cotton—

(44) Research is necessary to produce in this province cotton of medium staple combining high ginning percentage with good field outturn.

(45) The research staff of the Agriculture Department should be increased several-fold.

(46) A law should be enacted and enforced to prevent indiscriminate mixing of varieties of cotton by merchants and growers.

(47) Efficient distribution of pure cotton-seed should be ensured, Ginning—

(48) Ginning factories should be modernised and rationalised and supplied with reasonably cheap electricity, if possible.

(49) Cotton-growers should be encouraged to undertake ginning and pressing on co-operative lines.

(50) Legislation should be enacted to prevent malpractices damaging the staple, feel and colour of cotton by press-owners, merchants or growers.

## Mills—

(51) Existing mills should be rationalised by the replacement of their old and out-moded machinery by the latest and most efficient. The import of such machinery should be given high priority.

(52) Taking consumption at 30 yards per head per annum as the target, there is room for an additional 8,000 looms and about 250,000 spindles in the province.

(53) Some of the stores for the textile industry, like sizing materials, china clay, starch, gum, vegetable tallow; chemicals such as sulphuric acid, could and should be made in India instead of being imported.

(54) Mills should go in for greater varieties of yarn and cloth, such as superior shirtings, fine and medium dhotis and saris, printed, dyed and mercerised goods, which necessitate the introduction of dobbies, jacquards, multiple-box looms, combing, bleaching, printing and finishing and mercerising plants; some mills may specialise in some of these.

(55) A mill with 500 looms and 20,000 spindles may be considered an economic unit; such units may be started in places like Wun,

Chanda and Pulgaon with power supplied from the central thermal station.

(56) If it is not possible for the central thermal station to supply areas like Akola and Malkapur, the mills at these places might instal their own extraction turbines and be allowed to supply electricity at controlled rates to other industrial undertakings and/or to the public.

#### CHAPTER VIII.—INDUSTRIES BASED ON AGRICULTURAL, FOREST AND ANIMAL PRODUCTS

(57) Oil-seeds.—Oil-seeds, instead of being exported, should be crushed in the province.

(58) 20 to 25 factories, each crushing 40 to 60 tons a day are recommended.

(59) Cotton-seed instead of being fed to cattle, should be crushed locally; the oil should be refined for human consumption, and the cake used as cattle feed.

(60) The Government of India should encourage private enterprise to establish a central factory for the manufacture of oil-milling machinery, and obtain priority for the requisite plant.

(61) The oil-seeds industry in India should be freed from the control of the London market, exports should be discouraged and the internal market for the utilisation of the oil and cake maximised.

(62) The cess of one anna per rupee proposed by the Government of India to be levied on oil-seeds crushed by power-driven mills in India should be levied on exported seed also.

(63) The industry should be managed by private enterprise, but, if it is not forthcoming at once, Government should start a demonstration factory for crushing cotton-seed.

(64) Three factories each with a daily output of 25 tons, should be started in the cotton growing areas of Nagpur, Wardha and Berar for the manufacture of vegetable "ghee, *Vanaspati*". A fourth factory should be established near a caustic soda factory.

Oxygen—

(65) The "vegetable ghee" factories should be promoted by private enterprise.

(66) A composite factory consisting of an oil-crushing mill, a "vegetable ghee" factory and a soap factory will be more economical and is recommended.

Soap—

(67) New factories should produce boiled soaps instead of the crude process soaps now manufactured and may be distributed in consuming areas in suitable units. An aggregate output capacity of 15,000 tons a year in the immediate future is visualised. Mahua seed instead of being exported to Bombay and Calcutta should be crushed locally and used as soap fat. The industry should be promoted by private enterprise.

(68) Paints, etc.—Factories producing 500 to 600 tons of paints, varnishes, enamels and distemper a year may be established by private enterprise. The industry will need tariff protection.

(69) Orange Industry.—The industry is of more than provincial interest, and justifies the establishment of a Citrus Research Institute to be located in Nagpur, to improve the quality and explore the industrial possibilities of the fruit and to utilise its by-products and standardise them. The institute should run small pilot-plants to demonstrate improved methods and economies. Scholarships should



be awarded for study in America and England of fruit culture and preservation. Uptodate market facilities, including cold storage, should be provided in Nagpur and other orange centres.

(70) Special and appropriate facilities should be provided for transport by railways, like special wagons fitted with shelves, cold-storage, transport by special trains over long distances, covered platforms for loading and unloading and crates to pack fruit.

(71) Forests.—Forest policy should aim not only at selling forest produce raw but also at its industrial utilisation. The Forest Department should be adequately staffed and forest policy be re-orientated so as to put less emphasis on the revenue producing aspect of administration. The Utilisation Branch of the Forest Department should explore the possibilities and start pilot-plants where necessary to demonstrate lines of development in seasoning and chemical treatment of timber, wood distillation, essential oils, bobbins, etc.

Immediate steps should be taken to see that the reckless damage to private forests during recent years is repaired and that in future exploitation is carried on with strict regard to the public interest. The Provincial Government should obtain the requisite legislative powers to regulate and control these forests through the agency of the Forest Department.

Special steps should be taken to encourage the planting of *mahua* and *harra* trees.

(72) Paper.—A 40 tons-a-day factory is recommended for establishment in the Chanda district and a similar one in the Betul district. A third factory of 30 tons-a-day capacity is suggested for the Balaghat district. All the factories to be established by private enterprise. Paper production will have to be planned by the Central Government and technical help necessary for embarking on new lines of production like making kraft and wrapping papers should be given.

(73) Printing.—There should be provision in the Polytechnics for producing students annually for taking up positions of minor executives. There should be classes in the more important junior trade schools to produce annually some seven to eight each of compositors, machine minders and binders.

A factory for manufacturing printing machinery should be considered on an all-India basis.

(74) Plywood.—Details should be worked out for establishing a small plywood factory at Ballarshah.

(75) Bobbins.—Pioneering work in the manufacture of bobbins should be undertaken by the Industries Department in consultation with the Forest Research Institute, Dehra Dun.

(76) Rusa Oil.—A survey of areas where *motia* grass is grown in reasonable quantities and systematic propagation of the grass are necessary. It is suggested that an economic botanist attached to the Forest Department should work on the subject during the season and utilise spare time in a general economic botanical survey. A suitable organisation for distilling the oil will have to be established after detailed study.

(77) Wood distillation.—As it is understood that wood distillation is to be started in the province by influential business interests there would be no need for Government now to undertake the work but all help and assistance required may be given in order to establish this important industry.

(78) Lac and shellac.—An entomologist trained in Ranchi working under the Forest Department should organise the entire lac industry from the stage of cultivation.

(79) Dairy Industry.—Schemes for the improvement of ghee production like that recently started at Jhallar in Betul district with the utilisation of the by-products, skim milk for making milk powder and casein are recommended for adoption wherever possible. The Veterinary Department's proposals for establishing 20 big dairy units should be given effect to.

(80) Hides and Skins.—Arrangements should be made for training chamars in improved methods of flaying and curing.

(81) Tanneries.—Three tanneries are proposed for establishment one at Raipur, another at Nagpur and a third at Jubbulpore. Government should obtain control over these factories by taking 51 per cent of the shares.

(82) Bone crushing.—At least three but preferably more bone crushing plants should be established for the manufacture of super-phosphates. Government should guarantee to purchase the manure and distribute it along with ammonium sulphate.

#### CHAPTER IX.—SMALL-SCALE AND COTTAGE INDUSTRIES

(83) Government should actively take up the work of organising small-scale and cottage industries on co-operative lines. The Co-operative Department should be adequately staffed to meet the increasing demand by people for assistance and the opportunity offered by the war to strengthen the movement turned to full account.

(84) The large body of workers required for the task should be provided by a training school to be started immediately.

(85) Co-operative Societies which have proved their worth and competence should be recognised to the extent possible as Government agencies for administering controls in force effecting the manufacture, supply and distribution of commodities.

(86) Village artisans should be given intensive training in their crafts in the workshops attached to the proposed Junior Technical Schools in tahsil headquarters, so that they may be able to deal with machinery and improved implements which will find increased use in rural areas in future.

(87) The creation is recommended of mobile training parties consisting of three or four men on the scale of one or more to a Revenue Inspector's circle to teach village people not only crafts like smithy and carpentry but also in such subjects as flaying and curing of hides and skins, conservation and utilisation of farm-yard manure, anti-malaria measures, etc., etc. Two Rural Training Centres for training the instructors are suggested and such centres will require about 100 teachers who should be specially trained for the purpose.

(88) Improving the cottage industry by designing new machines and methods of work will be undertaken by the Industrial Institute to be established.

(89) Industrial Co-operatives will obtain technical help and advice from the proposed Industrial Engineering Service.

(90) An emporium exhibiting products of small-scale and cottage industries should be established in the Industrial Institute.

#### CHAPTER X.—INDUSTRIAL CHEMICALS

(91) The following factories should be established as soon as possible after the war near the Central Thermal Power Station :—

(a) 50,000 tons per year of ammonium sulphate;

(b) 10 tons per day of nitric acid, to be located near the ammonia factory; and

(c) 10 tons per day of nitro-cellulose;

These should be owned and managed by the Central Government; the Provincial Government and the neighbouring province should also share in ownership of the fertiliser factory, if expanded to produce a lakh tons.

(92) It should be investigated if the conversion of ammonia into ammonium sulphate by direct neutralisation with sulphuric acid or the gypsum method is more economical.

(93) Research should be made to find what type of fertiliser is best suited to C. P. soils; if nitrate were found more suitable than the sulphate it is easier to make it in the province as sulphur will not be required.

(94) A factory to produce ten tons per day of sulphuric acid should be started by private enterprise and located near Katni, and another similar factory at another place to be selected.

(95) A factory to produce 20 tons per day of soda ash, should be established at Katni.

(96) Associated with the above, a factory to produce nine tons a day of caustic soda should also be established near Katni.

(97) Another caustic soda factory should be started near Chanda associated with the proposed paper factory.

(98) Associated with the above, chlorine and bleaching powder industries should be started. All these alkali industries should be owned and managed by private enterprise.

(99) The Government distilleries in Betul and Seoni should be managed by the State and remodelled on up-to-date lines with a view to manufacturing rectified spirit or absolute alcohol and other by-products. If private management is continued, it should be entrusted to enterprising industrialists on long-term contracts.

(100) A factory for refining crude glycerine should be established near the Central Power Station as soon as crude glycerine becomes available from the soap factories proposed.

#### CHAPTER XI.—ENGINEERING INDUSTRIES

(101) The following should be established :

A Government Central Workshop and Stores by utilising the present Nagpur Engineering School Workshop as a nucleus.

(102) An Industrial Institute for research concerning problems of small-scale and cottage industries, such as conversion of discarded motor engines into stationary engines, designing furnaces for use of various fuels, improving agricultural implements, etc., and for planning small-scale industries like cutlery, hardware, pumps, oil-expellers, toys, electrical goods, etc.

(103) Divisional Workshops at Jabulpore, Amraoti and Raipur.

(104) Pending the establishment of a separate organisation for enforcing standards of quality, the Industrial Institute may undertake the work.

(105) An agricultural implements factory should be established.

(106) A museum should be opened at the institute.

(107) The province should have its due share of the large-scale engineering industries like motor cars, tractors, etc., contemplated by the Central Government.

(108) The engineering and manufacturing establishments started in the province for war purposes should not be closed down after the war but turned to civilian use and should work at the same speed as during the war.

(109) India should purchase suitable machinery surplus to the needs of England and the U. S. A.

## CHAPTER XII.—REORGANISATION OF THE INDUSTRIES DEPARTMENT

(110) In view of the great importance which the Department of Industries will occupy under the state of things we visualise, the appointment of a very highly qualified officer of the rank and salary of the Financial Commissioner with business experience to be called Director-General of Industries is recommended. He will have three assistants styled Deputy Directors-General in charge respectively of administrative, technical and business and commercial sides of industrialisation.

(111) There will also be the following officers:—

- (1) Director of Statistics and Commercial Intelligence.
- (2) Chief Electrical Engineer
- (3) Mining Adviser.
- (4) Textile Expert.
- (5) Leather Expert.
- (6) Industrial Chemist.

(112) An industrial engineering service should be organised.

(113) There will be a General Superintendent of the Central Workshop and Stores.

(114) There will be a library containing up-to-date books on every subject connected with industries in charge of a competent and technically-qualified librarian. This library and the information Bureau attached to it will be under the control of the Director of Statistics and Commercial Intelligence.

## CHAPTER XIII.—COMMERCIAL INTELLIGENCE AND STATISTICS

(115) The publication of the Rail-Borne Traffic of the Central Provinces and Berar should be resumed as early as possible.

(116) There should be a permanent Census Department at the centre with provincial branches staffed with experts in order that *ad hoc* enquiries may be carried out whenever necessary into such matters as employment, leisure, wages, habits, health, diet, cottage industries, etc., thus obviating the decennial census which is now considered largely out-of-date. The census will then be a continuous process as it is in the more advanced countries of the world.

## CHAPTER XIV.—STATE AID TO INDUSTRIES

(117) The Madras Government's classification of industries is accepted and the creation of a Provincial Post-War Reconstruction Committee is recommended to consider the claims of the Central Provinces to advise the Government of India panels on the location of various industries in the province.

(118) Research should be financed liberally and this is the greatest aid which the State can render to industries.

(119) Government should consider the question of exempting from income-tax donations for industrial research to universities and research institutions.

(120) An All-India Act should be passed and enforced making it obligatory on every one to use standard weights and measures.

(121) A thorough overhaul of Labour Code is necessary to ensure that labour throughout the country has a fair deal.

(122) Labour should be rationalised and made more efficient.

(123) Standardisation of industrial products should be insisted upon and adulteration of raw materials should be stopped by enacting and enforcing central legislation.

(124) An economic civil service should be established consisting of officers trained to study and solve industrial and economic questions.

## CHAPTER XV.—TRANSPORT

(125) The needs of Chanda and Balaghat districts and of Chhattisgarh generally should receive suitable priority when considering future road programmes.

(126) Cement concrete should be given undoubted preference over asphalt in road construction.

(127) The following railway bridges should be decked for road traffic :—

- (a) On the Nerbudda near Moretakka;
- (b) Erai three miles north-west of Chanda on the Chanda-Warora road;
- (c) Wardha between Majri and Wun;
- (d) Wainganga between Brahmapuri and Warsagunj;
- (e) Wardha near Ballarshah;
- (f) Purna between Daryapur and Murtizapur; and
- (g) Mahanadi near Arang.

(128) The bullock cart should be improved to make it more efficient and also in the interest of preservation of road surface.

(129) Railways.—A direct broad gauge line connecting Jubbulpore with Nagpur is recommended.

(130) It is desirable to have one uniform gauge for India, and all other gauges should in course of time be converted to that gauge.

(131) Railways should follow a more liberal policy in providing sidings for industries.

(132) The present preferential rates for traffic to and from the ports should be modified and lower rates charged in order to promote internal movements of raw materials and finished products.

(133) It is desirable that the Chamber of Commerce should set up an organisation to help industrialists to get the benefit of railway rates policy and appeal to the Railway Rates Advisory Tribunal when necessary.

(134) Railway rates should be charged on the total distance of haulage whether on one or more railways, and not on the distance on each railway system. This should be facilitated by the fact that almost all railways are now managed by the State.

(135) The navigation scheme of the Godavari and the Wardha river and their affluents should be given high priority in the post-war transport schemes of the province.

(136) The Central Provinces aerodromes should be maintained and improved and full advantage taken of the fact that Nagpur is an important centre of our airway system. A sufficient number of young men should get training in aeronautical engineering.

## CHAPTER XVI.—LOCATION OF INDUSTRY

(137) Large scale industrial concentrations are fraught with danger to the health and well-being of the community and India should learn from the experience of the west and prevent unregulated growth of large accretions of industrial population.

(138) The public interest requires industry to be spread throughout the country promoting an even distribution of economic welfare.

(139) The Central Provinces has a strong case for the following industries :—

Textiles, oil, vegetable ghee, soap and allied products, paper, tanning and leather, pottery and glass, iron and steel, alumina and aluminium.

(140) The creation of a Town Planning Department is recommended. Plans should be prepared for development of towns with a population of above 20,000 and development not in conformity with plans should be disallowed.

#### CHAPTER XVII.—TECHNICAL EDUCATION AND RESEARCH

(141) The general plan of the Sargent Report should be adopted but the period of forty years for its completion should be considerably reduced.

(142) To get over the dearth of teachers the question should be considered of making it a condition precedent to the award of the matriculation certificate or B. A. degree diploma that the candidate has served as a teacher for a prescribed period. While so engaged in teaching the pupil teachers receive suitable stipends.

(143) In addition to the Research Institutes on an All-India basis decided on by the Government of India, there should be established an Oil Technological Institute, preferably at Nagpur.

(144) A junior technical or trade school in each tahsil within the next five years should be started if possible, providing education in occupations connected with agricultural and allied products, textiles, engineering, mines, etc.

(145) All existing High Schools should within the next five years be provided with technical departments.

(146) Senior Technical Institutes or Polytechnics should be established in Nagpur, Jubbulpore, Amraoti and Raipur.

(147) The Government Engineering School in Nagpur should be converted into a Senior Polytechnic.

(148) The College of Science in Nagpur should be converted into a College of Science and Technology, if a separate College of Technology is not possible.

(149) It is a matter of supreme importance that ample provision should be made for research in the province. To this end the functions of the Provincial Industrial and Scientific Research Committee should be enlarged in order to include planning, directing and co-ordinating research and adequate funds placed at its disposal to enable it to perform its duties efficiently.

(150) Facilities for research should be provided not only in the College of Science in Nagpur but also in all colleges in the province teaching Science.

(151) Research should immediately be undertaken with regard to certain problems connected with coal, iron, manganese, oil-seeds, shellac, rice-husk, saw-dust, ceramics, cotton-linters, oranges, artificial silk, nitro-cellulose and varnishes.

(152) A larger number of scholarships for technological studies should be awarded, tenable in the Indian Institute of Science, Bangalore, Benares University, Bombay University Department of Technology, Victoria Technical Institute, Bombay, and the Laxminarayan Institute, Nagpur.

(153) Scholarships for technological studies should be awarded tenable in foreign countries like the U. S. A., England and Canada.

(154) Professors and lecturers in technological subjects in the Central Provinces should be given facilities to visit foreign countries for refresher studies.

(155) Experts should be imported from abroad on short-term contracts, where necessary.

(156) Selected Indians should be deputed to England, America and Russia to study planning system adopted in those countries.

## CHAPTER XIX.—CONCLUSION

In concluding this rapid survey of the industrial prospects of the province, we are fully conscious of the vastness and complexity of the task and the limitations of our enquiry. As we stated at the start, we were working against time and we have had therefore to dispense with the normal procedure of taking evidence, touring the province adequately, seeking the help of experts, and taking sufficient time to digest the evidence and write a comprehensive report. Our report is sketchy and leaves many gaps to be filled by subsequent enquiry. We trust however that we have been able to give a tolerably clear picture of the industrial possibilities of the province and if our report will help in some measure to promote the rapid industrialisation of the province with the wholehearted co-operation of the Government and the people, we shall be amply rewarded for our labours.

We wish to thank all those, individuals or bodies, who helped us in our task and in particular, the co-opted members who gave us freely of their time and knowledge at no small inconvenience to themselves. We wish also to place on record our appreciation of the services rendered to the Committee by the Secretary, Mr. P. T. Koman Nayar, who gave us the benefit of his professional training in India and abroad and of his knowledge and experience of the industries of the province extending over nearly a decade. Finally we should like to express our sense of obligation to Mr. V. K. Aiyar, Superintendent, Government Printing, and his staff for having printed this Report in record time.

P. S. RAU,  
*Chairman.*

K. N. NAGARKATTI,  
*Vice-Chairman.*

S. A. SALETORÉ,  
S. H. BATLIVALA,  
P. KODANDA RAO,

R. N. JHA,\*

M. E. R. MALAK,

C. M. HARLOW,

K. D. GUHA,

R. V. DESHMUKH,

*Members.*

NAGPUR :  
*The 28th February 1945.*

P. T. KOMAN NAYAR,  
*Member & Secretary.*

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\* Subject to a note (see page 129.)

**Note by Mr. R. N. Jha**

I have signed the report with which I am in entire agreement, but I feel I must emphasise one point, which, being fundamental, should be embodied in a separate note. The Committee have no doubt carefully surveyed the problems and made comprehensive recommendations but where are the pre-requisite conditions for their adoption and execution? A Section 93 Government however able it may be is entirely unfitted both by training and outlook for this task. Nobody will deny that only a National Government consisting of the trusted representatives of the people "can deliver the goods"; only such a Government will have the moral, not to speak of the legal, authority to call upon the people to make the requisite sacrifices involved in the rapid industrialisation of the province. It seems to me, therefore, of fundamental importance that the present deadlock be resolved and that a National Government constituted, in order, among other things, to lead India along the path of industrialisation and agricultural prosperity.



## APPENDIX A

### THE PROVINCIAL INDUSTRIES COMMITTEE, C. P. & BERAR

The following questionnaire issued by the Provincial Industries Committee is published for general information. Copies are being posted separately to individual establishments, but as time is short and as it is not possible to contact everybody, it is hoped that industrialists, capitalists, *entrepreneurs* and others interested in the industrialisation of the province will favour the

Committee with their views without delay on such part of the questionnaire as may interest them. Copies of the questionnaire can be had on application to the Secretary of the Committee.

Nagpur : P. T. KOMAN NAYAR,  
The 22nd Nov. 1944. Secretary.

### QUESTIONNAIRE

*(Replies should reach the Secretary of the Committee not later than the 20th December 1944.)*

1. Name and address—
2. Industry—
3. (a) Capital including reserve and other funds—  
(b) Liquid assets—  
(c) Block account—
4. Installed capacity—  
(a) Under various types of manufacturing units—  
(b) Power plant giving type and horse-power—

Accounting year ending within official year

1942-43

1937-38

5. Manufactured output under various heads with approximate total hours worked in each year—
6. Cost analysis per unit of manufacture under raw materials (various sub-heads); labour; power cost; fuel for other than power generation; stores; overhead and other charges—
7. Total profit before and after providing for taxation but allowing fully for depreciation—
8. (a) Average horse-power used  
x No. of hours worked during the year—  
(b) Quantity of fuel consumed—

NOTE.—Compare the above figures with results obtained elsewhere in this country and abroad and offer your comments, on the comparative efficiency of production.

9. State nature and sources of your raw material—
10. State location of your main markets for manufactured goods, giving approximate quantity supplied—
11. Have you any plans for the post-war extension of your own industry or for starting new ones? If so, give full details—

12. Do you require priority assistance for the import of new machinery? If so, state type, number and other details. Also give your opinion whether any of these or other items of machinery and parts hitherto imported can be satisfactorily manufactured in this country—
13. (a) What in your opinion is the function of the State in the development of industries generally?—
  - (b) Do you advocate the policy of active participation by the State in industries? If so, state what industries should be wholly State-owned and State-managed; and in what the State should hold a majority of shares although management will be by private agency, in what the State should only hold a portion of the shares together with some representation on the Directorate and lastly what industries should merely receive technical advice and assistance—
  - (c) In your own industry do you require assistance from the Provincial or Central Government for the establishing or stabilising of the industry? If so, indicate the nature and extent of such help—
14. (a) What in your opinion are the steps to be taken, both immediate and from a long-range point of view for meeting the extreme shortage of trained technical personnel in every branch and grade of industry such as establishment of research institutes, colleges of technology and engineering and polytechnics?—

(b) An essential part of the scheme would be the training of apprentices in industrial concerns. Indicate in what way you are prepared to co-operate in such schemes—

15. In what branches of industry do you consider it necessary to obtain the services of foreign experts? Give reasons—
16. The Central Government has under consideration a scheme for sending abroad promising and qualified young men for higher technical training. Indicate the branches of the industry in which they should be so trained with due regard to the interests of the province—
17. Can you provide employment for, or suggest ways of employing any of the various categories of trained technicians (*e.g.*, motor and engine drivers, fitters, smiths, mechanics, etc.), and other war returned personnel and can you suggest any scheme of further training of these various categories to make them suitable for civil employment?—
18. Have you any suggestions for converting the munition factories of the Province to peace-time use?—
19. Please state if there is any information which you desire to be kept confidential.

The following are some of the subjects to be dealt with by the Committee:—

**I. Textiles**—Textile mills; power-looms, ginning and pressing of cotton silk and sericulture; hosiery; manufacture of textile machinery; examination of existing types with reference to types of cotton; other fibres such as sann-hemp, linseed stalk fibre; wool; rayon requirements for industry; coir; rope and cordage; power belting.

**II. Minerals (Metals and electro-chemical industries)**—Minerals and mineral products; iron and steel and connected alloys; manganese and ferro-manganese, ferro-silicon; bauxite, alumina and allied products; calcium carbide; soap-stone; improved methods of raising coal; saline deposits in Berar; inorganic salts from minerals; graphite crucibles; non-ferrous metallurgical industries; copper; etc.

**III. Industrial chemicals and drugs**—Sulphuric acid, caustic soda, soda ash, bleaching agents, dyes and pigments, commercial solvents, fertilisers, chemicals for warfare, cartridges, explosives, production of liquid gases, coal distillation.

Light chemicals.

Drugs and pharmaceutical preparations.

Synthetic products.

**IV. Industries based on agricultural, forest and animal products**—Sugar, alcohol and beverages, processed foods and drinks, soaps, disinfectants, oils, paints, colours and varnishes, oil-cloth, leather and leather goods, tannin extracts, rayon celluloid and other cellulose derivatives, plastics, citrus products, concentration of fruit juices, essential oil from grasses, paper cardboard and straw board, phosphates and superphosphates, hydrogenation of oils, glues derived from groundnut cake, milk and lac products, wood distillation, plywood, bobbins, pencils, toys, matches, brushes.

**V. Engineering industries**—Workshops and foundries; machinery -accessories and tools manufacture; manufacture of precision tools and highspeed tools; industrial grading; testing and standards institute; manufacture of agricultural and industrial machinery; manufacture of components of standardised machines used for rural industries and parts of manufactured goods; wire; nails and screws, nuts and bolts and miscellaneous forgings; agricultural implements; buckets; cutlery; hollowware and hardware; small-ware such as needles, pins, buttons, etc.; lamps, mantles, stoves.

Steam engines, crude oil, diesel oil and petrol engine, alcohol engines.

Transport.

Manufacture of textile, sugar, paper, mining, cement, chemical and electrical machines.

Lathes, drilling machines—shearing machines, umbrellas, carts and perambulators.

Typewriters, accounting machines, calculators, sewing machines, electrical fittings and accessories, air conditioning plant, frigidaires, surgical instruments, bicycles, hosiery machines, match-manufacturing machines, etc.

**VI. Ceramics and cements**—Cement; refractories; tiles; pottery; earthen-ware pipes; glass, beads and bangles; China clay; porcelain-ware; sanitary fittings; electric insulators; lime-stone and lime.

**VII. Electricity and power**—Thermal and hydro-electric power; small-scale generation of power, charcoal gas producers and economic power units for rural areas for agricultural and industrial purposes; economic utilisation of fuels and waste products like rice husk for power generation and design of furnaces for industrial and domestic purposes; utilisation of seasonal factory power plant out of season for other purposes; electric traction; electrical and telegraph equipment and machine manufacture; wires, motors, lamps, transformers; switch gear; etc.

**VIII. Minor and cottage industries**—Co-operative industrial establishments; decentralisation of industries involving processing of agricultural produce; village workshops; power-loom establishment in villages; hand-loom, weaving; supply of yarn from textile mills to hand-loom and to village units of power-loom; subsidiary industries; manufacture of components of major industries; laboratories and workshops for designing new machines for use in cottage industries

**IX. Training of skilled personnel and research.**

## APPEN

STATEMENT No. 1.—*Showing incidence of receipts per*

		Bombay		Madras		Bengal		U. P.	
		20,849,840		49,341,810		60,306,525		55,020,617	
S. No.	Population Head of Revenue								
(1)	(2)	(3)		(4)		(5)		(6)	
		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.	
1	Land Revenue ..	1	10 5 7	1	3 0 3	0	10 0 8	1	2 11 9
2	Excise ..	2	0 7 0	1	7 10 9	0	10 3 0	0	12 5 0
3	Stamps ..	1	2 4 9	0	9 8 7	0	8 4 3	0	5 8 0
4	Registration ..	0	2 0	0	2 3 5	0	1 2 3	0	0 4 7
	Total ..	4	15 5 6	3	6 11 4	1	13 10 4	2	5 1 1
5	Other Taxes and Duties—General Sales Tax. ..	..		0	11 8 8	0	3 11 8	..	
6	Motor Spirit Sales Taxation Act ..	0	3 3 6	0	0 5 1	0	0 7 0	0	0 4 4
7	Profession Tax ..	..		..		0	0 3 2	..	
8	Agricultural Income-Tax ..	..		..		0	0 3 9	..	
9	Entertainment Tax ..	0	4 2 7	0	0 7 6	0	0 9 5	0	0 6 0
10	Betting Tax ..	0	4 11 8	0	0 1 8	0	0 8 0	0	0 0 2
11	Raw Jute Tax Act ..	..		..		0	1 3 9	..	
12	Luxury Tax ..	0	0 2 8	..		..		..	
13	Receipts from Tobacco Duties ..	0	1 11 0	0	0 8 5	..		..	
14	Urban Immovable Property Tax ..	0	7 0	..		..		..	
15	Prize Competition ..	0	0 2 0	..		..		..	
16	Sale of Cloth Act ..	..		0	0 0 4	..		..	
17	U. P. Sugar Factories Act ..	..		..		..		0	2 10 9
18	Motor Vehicles Tax ..	0	3 2 8	0	1 10 3	0	0 4 7	0	0 4 2
19	Miscellaneous ..	0	2 8 9	0	0 2 2	0	0 8 6	0	0 0 1
	Total ..	1	11 9 6	0	15 8 7	0	9 0 6	0	5 2 1
20	Education ..	0	1 5 5	0	0 4 0	Budget for 1944-45 not available.		0	0 5 6
21	Medical ..	0	2 3 7	0	0 4 6	Do.		0	0 2 3
22	Public Health ..	0	3 11 9	0	0 1 0	Do.		0	0 1 9
23	Agriculture ..	0	6 2 3	0	0 3 5	Do.		0	0 5 0
24	Veterinary ..	0	0 1 0	0	0 0 8	Do.		0	0 0 8
25	Co-operation ..	0	0 3 1	0	0 1 3	Do.		0	0 0 6
26	Industries ..	0	0 10 9	0	1 4 1	Do.		0	2 5 6
	Total ..	0	15 2 4	0	2 7 3	..		0	3 9 8
	Grand Total ..	7	10 5 6	4	9 3 4	2	6 11 0	2	14 1 0
Total Revenue per hundred of population.									
		1,194	0 0	612	3 2	..		441	9 7
Total Expenditure per hundred of population.									
		977	12 10	519	1 7	504	11 4	439	14 4

## DIX B

*head of the population according to budget estimates for 1944-45.*

Punjab			Bihar			C. P. & Berar			Assam			N. W. F. P.			Orissa			Sind		
28,418,819			36,340,151			16,813,584			10,204,733			3,038,067			8,728,544			4,535,008		
(7)			(8)			(9)			(10)			(11)			(12)			(13)		
Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	p.
1	2	1.3	0	6	1.3	1	7	9.7	1	10	3.6	0	11	6.7	0	9	8.3	1	7	0.9
0	14	6.0	0	9	4.3	0	11	3.5	0	6	3.8	0	6	2.4	0	6	10.6	1	7	2.4
0	6	5.7	0	7	4.2	0	6	1.9	0	2	11.7	0	4	1.7	0	4	1.8	0	7	4.9
0	1	1.3	0	0	11.7	0	1	1.7	0	0	5.3	0	0	7.0	0	0	6.6	0	1	1.9
2	7	8.9	1	7	9.4	2	10	4.8	2	4	0.5	1	6	5.8	1	5	3.3	3	6	10.8
0	1	4.7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0	0	6.5	0	0	2.4	0	0	5.7	0	3	11.2	0	0	5.7	..	..	..	0	2	7.8
..	..	..	..	..	..	0	0	3.4	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	0	0	9.7	..	..	..	0	3	5.0	..	..	..	..	..	..	..	..	..
0	0	6.1	0	0	1.8	0	0	3.4	0	0	2.6	0	0	10.7	..	..	..	0	2	3.6
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0	0	2.5
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0	0	0.8	..	..	..	0	0	2.4	..	..	..	0	0	0.3	..	..	..	0	0	6.2
0	1	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
0	0	7.6	0	0	0.5	0	0	6.4	0	1	6.0	0	1	5.6	0	0	1.4	0	0	10.8
0	0	0.1	0	0	0.3	0	0	0.3	0	0	0.1	0	0	0.2	..	..	..	0	0	1.5
0	4	4.7	0	1	2.7	0	1	9.6	0	8	6.9	0	2	10.5	0	0	1.4	0	6	8.4
0	1	3.4	Budget for 1944-45 not available.			0	0	9.2	0	0	6.7	0	0	9.2	0	0	4.2	0	0	5.2
0	0	9.8	Do.			0	0	1.3	0	0	3.1	0	1	11.0	0	0	1.9	0	0	8.3
0	0	1.9	Do.			0	0	1.5	0	1	3.2	0	0	0.6	0	0	0.4	0	0	7.9
0	2	5.4	Do.			0	1	1.0	0	2	4.4	0	0	7.9	0	0	2.7	1	1	6.2
0	0	1.9	Do.			0	0	1.2	0	0	0.8	0	0	3.1	0	0	0.6	0	0	0.4
0	0	2.1	Do.			0	0	0.1	0	0	0.2	0	0	1.0	0	0	1.9	0	0	1.0
0	0	9.4	Do.			0	0	1.5	0	0	1.0	0	0	6.1	0	4	2.1	0	0	8.3
0	5	9.9	..	..	..	0	2	3.8	0	4	7.4	0	3	4.9	0	5	1.8	1	4	1.3
3	1	11.5	1	9	0.1	2	14	6.2	3	1	2.8	1	12	9.2	1	10	6.5	5	1	8.5
690	11	2.0	..	..	..	480	11	2.0	442	9	7.0	746	9	7.0	294	6	5.0	1,758	0	0.0
680	9	11.0	208	2	7.0	399	15	2.0	428	5	4.0	755	5	4.0	306	3	11.0	1,340	12	4.0



STATEMENT NO. II—Showing the incidence of expenditure per head of the population on the nation-building departments in the various provinces according to the budget estimates for 1944-45.

	Madras	Bombay	Bengal(a)	U. P.	Punjab	Bihar(a)	Orissa	Assam	N.-W.F.P.	Sind	C. P. & Berar
	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.	T. Rs.
<b>Total Revenue</b>	30,20,74	24,89,56	..	24,30,19	19,63,91	..	2,56,96	4,51,71	2,26,82	7,97,27	8,08,31
<b>Total Expenditure</b>	25,61,32	20,38,70	30,43,78	24,20,33	19,34,26	7,56,46	2,67,32	4,37,11	2,29,47	6,08,04	6,64,13
<b>Population as per 1941 census (in thousands).</b>	4,93,42	2,08,50	6,03,07	5,50,21	2,84,19	3,63,40	87,29	1,02,05	30,38	45,35	1,68,14
Departments	Total expenditure	Expenditure per head	Total expenditure	Expenditure per head	Total expenditure	Expenditure per head	Total expenditure	Expenditure per head	Total expenditure	Expenditure per head	Expenditure per head
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(11)
(1) Education	3,65,66	0 11 10	2,33,03	1 1 10	..	..	2,44,59	0 7 1	2,08,27	0 11 9	..
(2) Medical	1,32,63	0 4 3	72,38	0 5 5	..	..	81,22	0 2 5	62,04	0 3 6	..
(3) Public Health	35,88	0 1 2	54,29	0 4 2	..	..	34,29	0 1 0	36,66	0 2 0	..
(4) Agriculture	46,37	0 1 6	1,02,44	0 7 10	..	..	85,64	0 2 6	76,02	0 4 3	..
(5) Veterinary	17,34	0 0 7	6,33	0 0 6	..	..	11,08	0 0 4	20,05	0 1 2	..
(6) Co-operation	19,71	0 0 8	10,46	0 0 10	..	..	8,99	0 0 3	29,13	0 1 8	..
(7) Industries	56,22	0 1 10	19,27	0 1 6	..	..	1,10,04	0 3 2	31,37	0 1 9	..
(8) Police (b)	2,24,48	0 7 4	2,35,39	1 2 1	..	..	3,18,74	0 9 3	2,34,52	0 13 2	..
(9) Civil Works (b)	1,66,94	0 5 5	1,40,28	0 10 9	..	..	1,84,91	0 5 5	1,22,28	0 6 11	..
(10) General Administration. (b)	3,06,93	0 9 11	1,03,27	0 7 11	..	..	1,67,00	0 4 10	1,44,53	0 8 2	..

Departments	(12)		(13)		(14)		(15)		(16)		(17)		(18)		(19)		(20)		(21)		(22)		(23)	
	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.	T. Rs.	Rs. a. p.
(1) Education	..	82,03	0 3 8	..	31,76	0 5 10	47,59	0 7 6	27,82	0 14 8	42,07	0 14 10	59,50	0 5 8										
(2) Medical	..		..	..	12,33	0 2 3	16,95	0 2 7	10,56	0 5 7	15,07	0 4 10	21,16	0 2 0										
(3) Public Health	..		..	..	3,40	0 0 8	14,50	0 2 3	1,99	0 1 1	4,43	0 1 7	6,51	0 0 8										
(4) Agriculture	..		0 5 0	..	6,25	0 1 2	28,24	0 4 5	2,91	0 1 6	72,95	0 2 7	20,65	0 2 0										
(5) Veterinary	..		..	..	1,81	0 0 4	2,61	0 0 5	2,85	0 1 6	1,38	0 0 6	5,72	0 0 7										
(6) Co-operation	..		..	..	2,58	0 0 6	2,76	0 0 5	1,89	0 1 0	1,23	0 0 5	3,40	0 0 4										
(7) Industries	..		..	..	23,95	0 4 5	3,45	0 0 7	1,33	0 0 8	2,93	0 1 0	5,90	0 0 7										
(8) Police (b)	..		..	..	30,74	0 5 8	38,68	0 6 1	50,95	1 10 10	57,65	1 4 4	90,54	0 8 7										
(9) Civil Works (b)	..	(a)	..	..	24,34	0 4 6	44,09	0 6 11	29,31	0 15 6	40,42	0 14 5	59,76	0 5 8										
(10) General-Administration. (b)	..		..	..	34,03	0 6 3	41,16	0 6 6	25,12	0 13 3	35,54	0 11 6	55,57	0 7 8										

(a) Bengal and Bihar budgets for 1944-45 not available. (b) Departments nos. (8) to (10) have been retained to complete the statement.

STATEMENT NO. III.—*Showing the percentages of Expenditure under  
“Education, budget estimates*

	[In 'Thousands]			
	Madras	Bombay	Bengal	United Provinces
Total Provincial Revenue ..	30,20,74	24,89,56		24,30,19
Total Provincial Expenditure [Excluding transfer of excess of land revenue collections and revenue surplus over normal receipts to “Aproportion for reduction, etc., of debt and P. W. R. and D. Fund.”]	25,61,32	20,38,70	30,43,78	24,20,33
<i>I. Education</i> ..	3,65,66	2,33,03		2,44,59
Percentage to Revenue ..	12.11	9.36		10.07
Percentage to Expenditure ..	14.28	11.43		10.11
<i>II. Medical</i> ..	1,32,63	72,38		81,22
Percentage to Revenue ..	4.39	2.91		3.37
Percentage to Expenditure ..	5.18	3.55		3.38
<i>III. Public Health</i> ..	35,88	54,29		34,29
Percentage to Revenue ..	1.16	2.18		1.41
Percentage to Expenditure ..	1.40	2.66		1.41
<i>IV. Agriculture</i> ..	46,37	1,02,44		85,64
Percentage to Revenue ..	1.54	4.11		5.53
Percentage to Expenditure ..	1.81	5.02		5.5
<i>V. Veterinary</i> ..	17,34	6,33		11,08
Percentage to Revenue ..	0.57	0.25		0.46
Percentage to Expenditure ..	0.68	0.31		0.46
<i>VI. Co-operation</i> ..	19,71	10,46	(A)	8,99
Percentage to Revenue ..	0.65	0.42		0.37
Percentage to Expenditure ..	0.77	0.51		0.37
<i>VII. Industries</i> ..	56,22	19,27		1,10,04
Percentage to Revenue ..	1.86	0.77		4.53
Percentage to Expenditure ..	2.20	0.95		4.55
<i>VIII. General Administration</i> ..	3,06,93	1,03,27		1,67,00
Percentage to Revenue ..	10.16	4.15		6.87
Percentage to Expenditure ..	11.99	5.07		6.90
<i>IX. Police</i> ..	2,24,48	2,35,39		3,18,74
Percentage to Revenue ..	7.44	9.45		13.11
Percentage to Expenditure ..	8.77	11.54		13.15
<i>X. Civil Works</i> ..	1,66,94	1,40,28		1,84,91
Percentage to Revenue ..	5.53	5.63		7.61
Percentage to Expenditure ..	6.52	6.88		7.64
<i>XI. Forest</i> ..	65,52	1,18,35		66,04
Percentage to Revenue ..	2.17	4.75		2.72
Percentage to Expenditure ..	2.56	5.81		2.73

(A) Bengal and Bihar Budgets

*etc."* to total Revenue and Expenditure in various province according to the  
for 1944-45.

of Rupees]

Punjab	Bihar	Orissa	Assam	N.-W. F. P	Sind	Central Provinces and Berar
19,63,19	..	2,56,96	4,51,71	2,26,82	7,97,27	8,08,31
19,34,26	7,56.46	2,67,32	4,37,11	2,29,47	6,08,04	6,53,54
2,08,27		31,76	47,59	27.82	42,07	59,50
10.61		12.36	10.53	12.27	5.27	7.36
10.76		11.88	10.88	12.12	6.92	9.10
62,04		12,33	16,95	10,56	13,67	21,16
3.16		4.80	3.75	4.66	1.71	2.61
3.21		4.61	3.88	4.60	2.25	3.24
36,66		3,40	14,50	1,99	4,43	6,51
1.87		1.32	3.21	0.87	0.56	0.80
1.89		1.27	3.32	0.88	0.73	0.99
76,02		6,25	28,24	2,91	72,95	20,66
3.87		2.43	6.25	1.28	9.15	2.55
3.93		2.34	6.46	1.27	11.99	3.16
20,05		1,81	2,61	2,85	1,38	5,72
1.02		0.70	0.58	1.26	0.17	0.71
1.04		0.68	0.60	1.24	0.23	0.88
29,13	(A)	2,58	2,76	1,89	1,23	3,40
1.48		1.00	0.61	0.83	0.15	0.42
1.50		0.96	0.63	0.82	0.20	0.52
31,37		23,95	3,45	1,33	2,93	5,90
1.60		9.33	0.76	0.59	0.37	0.73
1.62		8.96	0.79	0.58	0.48	0.90
1,44,53		34,03	41,16	25,12	33,54	80,87
7.36		13.24	9.11	11.08	4.21	10.00
7.47		12.74	9.41	10.94	5.52	12.37
2,34,52		30,74	38,68	50,95	57,65	90,54
11.94		11.96	8.56	22.47	7.23	11.20
12.12		11.50	8.85	22.20	9.48	13.85
1,22,28		24,34	44,09	29,31	40,42	59,76
6.23		9.47	9.76	12.92	5.07	7.39
6.32		9.10	10.09	12.77	6.65	9.14
69,84		9,16	18,15	5,71	9,26	76,48
3.56		3.57	4.02	2.52	1.16	9.24
3.61		3.43	4.15	2.49	1.52	10.70

for 1944-45 not available.

STATEMENT NO. IV.—*Showing the rate of expenditure in Rupees per head of population in the Provinces of India.*

(The figures are based on the actuals of 1933-34.)

	Name of Province																											
	Madras				Bombay				Bengal				United Provinces				Punjab				Bihar and Orissa				Central Provinces			
Area in square miles (in thousands).	14.2				12.4				78				10.6				99				83				1,00			
Population (in millions)	46.7				21.9				50.1				48.4				23.6				37.7				15.5			
<i>Major heads of Expenditure.</i>																												
	Rs. a. p.				Rs. a. p.				Rs. a. p.				Rs. a. p.				Rs. a. p.				Rs. a. p.				Rs. a. p.			
Land Revenue	..	0	0	8	0	4	7	0	1	2	0	2	5	0	2	5	0	0	9	0	1	13						
Excise	..	0	1	1	0	3	6	0	0	7	0	0	5	0	0	8	0	0	8	0	1	0						
Stamps	..	0	0	2	0	0	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1						
Forest	..	0	1	4	0	2	6	0	0	6	0	1	0	0	1	8	0	0	4	0	3	6						
Registration	..	0	1	0	0	0	5	0	0	9	0	0	2	0	0	7	0	0	10	0	0	2						
Irrigation	..	0	3	4	0	10	3	0	1	0	0	3	6	0	9	10	0	1	0	0	3	6						
General Administration		0	9	4	0	8	5	0	4	0	0	4	7	0	6	11	0	2	11	0	6	9						
Administration of Justice.		0	3	3	0	5	1	0	3	1	0	2	4	0	3	6	0	1	4	0	2	9						
Jails and Convict Settlements.		0	0	9		1	8	0	1	4	0	1	0	0	2	0	0	0	9	0	0	10						
Police	..	0	5	7	0	13	2	0	7	2	0	5	5	0	8	2	0	3	7	0	6	1						
Scientific Departments		0	0	7	0	0	9																					
Education	..	0	8	6	0	13	11	0	4	1	0	5	4	0	10	5	0	3	7	0	5	1						
Medical	..	0	3	0	0	3	6	0	1	7	0	1	0	0	2	11	0	1	1	0	1	0						
Public Health	..	0	0	9	0	1	9	0	1	2	0	0	8	0	0	10	0	0	5	0	0	4						
Agriculture	..	0	0	7	0	1	1	0	0	4	0	0	8	0	1	8	0	0	4	0	0	11						
Veterinary	..	0	0	10	0	0	10	0	0	2	0	0	2	0	0	10	0	0	2	0	0	5						
Co-operative Credit	..	0	0	5	0	0	5	0	0	10	0	0	2	0	0	9	0	0	2	0	0	2						
Industries	..	0	0	6	0	0	10	0	0	5	0	0	5	0	0	9	0	0	4	0	0	2						
Miscellaneous Departments.		0	1	8	0	0	10	0	0	1									0	0	2							
Civil Works	..	0	5	1	0	6	8	0	2	5	0	1	7	0	6	5	0	1	2	0	5	7						
Famine	..												0	0	2													
Superannuation allowances and Pensions.		0	2	11	0	7	8	0	2	2	0	2	11	0	4	2	0	1	6	0	3	10						
Stationery and Printing.		0	0	8	0	0	10	0	0	8	0	0	6	0	0	6	0	0	4	0	0	6						
Miscellaneous	..	0	0	2	0	1	11	0	0	8	0	0	6	0	1	7			0	0	8							

# STATEMENT No. V—Analyses of Central Provinces Coals.

(S=Percentage of sulphur.)

No.	Moisture	Vol. matter	Fixed carbon	Ash	Calories per gram	Field and location
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	5.16	27.70	43.30	23.84	5,617	<i>Tatapani</i> — <i>Tatapani nala</i> , 2 miles N.W. of Bhorini.
2	13.83	28.04	47.59	10.54	6,098	<i>Rankola</i> — <i>Suknai nala</i> , near Sarsera.
3	2.97	26.02	62.72	8.29	7,092	<i>Jhimli</i> — <i>Rangama Jharra</i> , E.N.E. of Kundhour, near Kupi.
4	5.79	28.22	44.80	21.19	..	<i>Sanhat</i> —Lower seam. Murva and neighbourhood (average of 3 samples).
5	4.19	24.00	44.01	27.81	..	<i>Sanhat</i> —Upper seam. Nagar area (average of 5 samples).
6	7.20	31.05	55.05	6.69	7,056	<i>Jhagrakhand</i> — <i>Bhukbhuka nala</i> , 2½ miles S.W. of Khongapani.
7	8.66	30.92	48.86	11.56	..	<i>Kurasia</i> — <i>Kurasia</i> (average of 6 samples).
8	7.70	29.10	51.20	12.00	7,000	<i>Kurasia</i> — <i>Chirmiri</i> (average of 10 samples).
9	6.32	29.35	58.06	12.59	6,973	<i>Kurasia</i> —Average of 3 seams now worked.
10	4.1	38.2	57.7	4.1	..	<i>Busrampur</i> — <i>Rer river</i> .
11	8.88	28.71	49.85	12.56	..	<i>Lakhanpur</i> —(Lingha area) <i>Lachi nala</i> near Salih (average of 2 samples, one from each seam).
12	6.9	29.06	53.93	10.10	..	<i>Korba</i> — <i>Ghordewa</i> seam (5' seam, 2 samples).
13	5.90	26.4	63.4	11.2	6,449	<i>Korba</i> — <i>Ghordewa</i> seam (Wagon of coal sent to Bombay).
14	8.40	27.0	39.44	25.5	5,060	<i>Korba</i> — <i>Sonpuri</i> seams (average of 3 seams) (S=0.55).
15	8.67	31.19	52.1	8.0	6,222	<i>Korba</i> — <i>Rajgamar</i> seam (average of 5 samples) (S=0.43)
16	4.10	24.46	26.49	44.95	..	<i>Mand River</i> — <i>Jubilee seam</i> (19') (average of field assay).

## STATEMENT No. V—Analyses of Central Provinces Coals—cont.

No.	Moisture.	Vol. matter (3)	Fixed carbon (4)	Ash (5)	(S = Percentage of sulphur).		Field and location
					Calories per grain (6)	(7) (average of field assay).	
(1)	(2)						
17	4.77	25.53	34.20	35.50	..	Mand River—Hira Lal seam (13)	(average of field assay).
18	2.52	24.26	48.71	24.01	(3) 6,500	Molpani—Coal (average of 10 samples)	(S=0.50).
19	2.84	20.55	37.43	38.24	..	Molpani—Splint (S=0.95).	
20	2.44	30.76	49.58	17.24	6,515	Kanhan valley—(Damua).	
21	2.40	28.66	50.14	18.80	6,348	Kanhan valley—(Ghorawari).	
22	3.76	29.80	39.96	26.48	5,226	Kanhan valley—(Jinnaur).	
23	6.10	28.22	41.84	23.84	5,372	Kanhan valley—(Chogni).	
24	7.86	29.64	44.41	18.09	Around 5,700	Pench valley—Central part of the field (average of 7 samples).	
25	2.26	29.00	50.34	18.40	Around 6,000	Pench valley—Western part of the field (average of 3 samples).	
26	7.38	29.98	44.52	18.12	5,649	Pench valley—(Barkui) full seam.	
27	1.68	21.98	51.62	24.72	6,224	Pench valley—(Barkui) roof and floor coal.	
28	7.48	31.24	44.24	17.04	5,688	Pench valley—(Chandameta).	
29	6.98	28.47	45.14	19.41	5,668	Pench valley—(Eklaira).	
30	7.69	29.99	42.12	20.20	5,468	Pench valley—(Newton Chikhli).	
31	5.55	29.84	49.35	15.26	6,286	Pench valley—(Ravanwara).	
32	(3) ..	28.0	61.6	10.4	..	Pench valley—(Sirgora).	
33	8.1	25.4	38.6	27.8	5,300	Warora.	
34	10.91	35.30	49.30	15.40	6,539	Rajur.	
35	13.0	30.3	53.7	15.7	6,475	Ghugus—(Average of 3 samples).	

**STATEMENT No. VI—Showing production of coal\* in Central Provinces and Berar in thousand tons.**

Name of Proprietor	1936	1937	1938	1939	1940
<i>Chhindwara District.</i>					
1. Messrs. Shaw Wallace & Co.	.. 692	676	733	757	808
2. Newton Chickli Colliery Ltd.	.. 156	187	210	206	217
3. Hirdagarh Colliery Ltd	.. 189	88	111	114	127
4. C. P. Syndicate Ltd.	.. 59	75	102	113	103
5. Other Collieries	.. 164	299	214	183	231
<b>Total Chhindwara</b>	<b>.. 1,259</b>	<b>1,234</b>	<b>1,370</b>	<b>1,373</b>	<b>1,488</b>
<i>Chanda District.</i>					
1. Sir B. D. Daga and Sir M. B. Dadabhoy	174	180	192	201	190
2. Birla Bros. Ltd.	.. 36	49	48	48	34
3. Other Collieries	.. 37	35	40	42	32
<b>Total Chanda</b>	<b>.. 247</b>	<b>264</b>	<b>279</b>	<b>291</b>	<b>256</b>
<i>Yezmal District.</i>					
Sir B. D. Daga and Sir M. B. Dadabhoy	..	..	5	32	35
<i>Betul District.</i>					
Miscellaneous	.. 17	6	..	..	..
<i>Bilaspur District.</i>					
Miscellaneous	.. ..	..	..	..	..
<b>Grand Total for C. P. &amp; Berar</b>	<b>.. 1,508</b>	<b>1,504</b>	<b>1,659</b>	<b>1,696</b>	<b>1,779</b>

**STATEMENT No. VII—Analyses of Chanda iron ores.**

	Fe	Sio2	S	P
Asola .. ..	65.99	3.89	..	..
Dewalgaon .. ..	61.2	11.04	..	..
	67.76	1.50	..	..
Lohara .. ..	69.21	0.82	0.012	0.005
Pipalgaon .. ..	71.05	4.5	Trace	Trace
Poser .. ..	69.8	..	..	..
Ratnapur (limonite) .. ..	49.7	26.0 (Insol.)	..	..

**STATEMENT No. VIII—Range of analyses of Manganese ores from the gonditic deposits of the Central Provinces and Means of above analyses.**

	Balaghat	Bhandara	Chhindwara	Nagpur
Number of analyses	13	13	9	30
Manganese ..	49.08—54.51	49.00—54.07	48.95—54.97	42.28—56.52
Iron ..	5.28—9.10	3.86—10.25	5.00—11.77	2.09—16.34
Silica ..	1.62—6.02	2.08—6.50	4.98—10.63	2.90—18.48
Phosphorus ..	0.04—0.24	0.06—0.34	0.06—0.28	0.04—0.65
Moisture ..	0.12—0.85	0.09—1.00	0.00—1.27	0.11—1.32

\*Figures have been taken from the *Report on Labour in Coal Mines in Central Provinces and Berar*, pages 8, 9 and 10.



*Means of above analyses*

	Balaghat	Bhandara	Chhindwara	Nagpur
Number of analyses	13	13	8	30
Manganese ..	51.88	51.94	52.72	51.53
Iron ..	7.40	7.27	7.08	6.24
Silica ..	3.74	4.59	7.16	7.25
Phosphorus ..	0.11	0.14	0.14	0.11
Moisture ..	0.37	0.44	0.38	0.49

STATEMENT No. IX—*Showing raisings of manganese in Central Provinces and Berar.*

		Tons.
1909—13	..	2,442,425
1914—18	..	2,479,400
1919—23	..	2,527,010
1924—28	..	3,302,795
1929—33	..	1,582,665
1934	..	180,025
1935	..	385,179
1936	..	568,806
1937	..	695,177
Total up to 1937	..	14,169,482
1938	..	646,465
1939	..	546,028
1940	..	652,755
Grand Total	..	16,104,730

N.B.—(1) Figures up to 1937 have been taken from the Central Provinces Government publication *Mineral Resources of the Central Provinces and Berar*, page 5.

(2) Figures for 1938, 1939 and 1940 have been taken from the reports of the Chief Inspector of Mines in India.

(3) Figures for subsequent years are not available.

STATEMENT No. X—*Table of quality of bauxite*

	Range	Average of better grades	Best grades		
			(1)	(2)	(3)
SiO <sub>2</sub>	.. 1—20	2.5	1.10	1.20	0.38
TiO <sub>2</sub>	.. 5—11	8	8.75	7.01	11.61
Al <sub>2</sub> O <sub>3</sub>	.. 40—65	60	61.30	60.49	65.48
Fe <sub>2</sub> O <sub>3</sub>	.. 2—8	3—4	2.50	2.50	3.77
Moisture	.. 0.3—1.5	0.5	0.01	0.27	1.06
Combined water	.. 19—29	26	25.55	28.53	18.32

## STATEMENT NO. XI—Showing particulars of the textile mills in the province.

Name of mill	Agent's name	Where situated	Capital Rs.	No. of spindles	No. of looms	Cotton consumed in bales of 784 lbs.	No. of persons employed daily	Total No. of days worked in the year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>A.—Berar</b>								
(1) Berar Manufacturing Co., Ltd. ..	Kastureland Dadabhai and Company.	Badnera ..	5,50,000	21,384	367	3,441	937	307
(2) R. S. Reckhand Gopaldas Mohota Spinning and Weaving Mills.	Seth Gopaldas Mohota, Proprietor.	Ako'a ..	Not available	22,476	466	8,558	1,303	295
(3) Sawatram Ramprasad Mills Co., Ltd.	Seth Sawatram Ramprasad ..	Do. ..	8,00,300	12,762	292	4,666	1,968	261
(4) Vidarbha Mills, Ltd., Berar ..	Deshmukh and Company ..	Ellichpur ..	16,70,000	12,092	327	4,955	1,544	290
	Total ..		30,20,300	68,714	1,454	21,670	5,752	..
<b>B.—Central Provinces</b>								
(1) Burhanpur Tanti Mills, Ltd. ..	P. N. Mehta and Sons ..	Burhanpur ..	12,00,000	30,071	515	8,047	2,931	290
(2) The Empress Mills ..	Tata Sons Ltd. ..	Nagpur ..	96,87,500	115,188	2,168	33,222	12,446	292
(3) Model Mills, Ltd., Nagpur ..	Bansilal Abirchand Dadabhai and Company.	Do. ..	94,91,850	52,408	950	3,012	3,755	273
(4) Pulgaon Cotton Mills, Ltd. ..	Hardayal Nivatia ..	Pulgaon ..	4,00,000	21,040	234	5,492	1,897	209
(5) R. B. Bansilal Abirchand Spinning and Weaving Mills.	R. B. Seth Narsingdas and Seth Ramnath Daga, Owners.	Hunganghat ..	Not available.	31,600	394	4,269	1,682	225
(6) R. S. Reckhand Mohota Spinning and Weaving Mills.	Seth Mathuradas Mohota, Proprietor.	Do. ..	Not available.	22,114	413	3,574	1,488	233
	Total ..		2,07,79,350	272,421	4,674	63,665	24,199	..
	Grand Total ..		2,37,99,650*	341,135	6,128	90,285	29,951	..

\*This represents only the share capital of the seven companies for which figures are available.

STATEMENT No. XII—*Statement showing the quantity  
(in lbs. and equivalent in yards) and description of  
(cotton) woven goods manufactured in the Central  
Provinces and Berar.*

Description				Twelve months from April to March	
				1937-38	1941-42
(1)				(2)	(3)
<b>Grey and bleached piece-goods—</b>					
Chadars	..	lbs	..	2,730,850	2,827,101
		Yards	..	5,663,759	5,703,648
Dhotis	..	lbs.	..	7,920,006	6,504,382
		Yards	..	34,857,560	25,668,291
Drills and jeans	..	lbs.	..	1,795,555	2,139,733
		Yards	..	6,519,128	6,264,233
Cambrics and lawns	..	lbs.	..	218,489	121,515
		Yards	..	1,913,719	1,144,282
Printers	..	lbs.	..	116,389	133,174
		Yards	..	649,749	765,406
Shirting and longcloth	..	lbs.	..	2,791,664	6,565,441
		Yards	..	10,819,701	22,139,583
T. cloth (domestics) and sheetings	..	lbs.	..	328,180	1,036,375
		Yards	..	1,011,249	2,745,031
Tent-cloth	..	lbs.	..	313,933	655,861
		Yards	..	845,606	1,281,589
Khadi, dungri or khaddar	..	lbs.	..	3,256,280	3,137,641
		Yards	..	8,714,945	8,045,091
Other sorts	..	lbs.	..	423,640	964,631
		Yards	..	1,894,306	4,135,257
Total	..	lbs.	..	19,894,996	24,085,854
		Yards	..	72,889,722	77,892,413
Coloured piece-goods	..	lbs.	..	4,031,623	5,383,996
		Yards	..	12,666,969	17,344,041
Grey and coloured goods other than piece-goods.	..	lbs.	..	203,618	591,373
		Dozens	..	106,717	275,922
Hosiery	..	lbs.	..	..	..
		Dozens	..	..	..
Miscellaneous	..	lbs.	..	633,143	789,193
Cotton goods mixed with silk or wool	..	lbs.	..	..	..
Grand Total	..	lbs.	..	24,763,380	30,850,416
		Yards	..	85,556,691	95,236,454
		Dozens	..	106,717	275,922

**STATEMENT No. XIII—Statement showing the quantity  
(in lbs.) and the counts (or numbers) of (cotton) yarn spun  
in the Central Provinces and Berar.**

Count or number	Twelve months from April to March		
	1937-38	1941-42	Percentage of total in 1941-42
1	39,274	62,895	..
2	1,003,712	1,182,867	..
3	127,770	162,570	..
4	298,852	544,001	..
5	76,659	22,802	..
6	605,761	757,408	..
7	4,349,517	2,430,914	..
8	1,204,180	846,193	..
9	4,532,388	3,827,921	..
10	1,566,476	2,377,487	..
Total Nos. 1 to 10	13,894,589	12,215,058	19
11	3,637,309	6,147,924	..
12	2,146,463	4,395,922	..
13	5,248,156	7,664,641	..
14	3,416,601	5,777,801	..
15	3,352,414	5,964,941	..
16	1,742,538	2,363,310	..
17	2,505,142	3,353,877	..
18	846,730	644,421	..
19	411,463	153,745	..
20	3,306,339	3,166,312	..
Total Nos. 11 to 20	26,613,155	39,632,894	63
21	2,731,549	3,655,169	..
22	487,048	255,228	..
23	123,302	69,409	..
24	1,790,849	3,075,722	..
25	457,833	116,118	..
26	827,484	394,095	..
27	7,351	11,093	..
28	337,728	197,037	..
29	..	612	..
30	335,521	321,970	..
Total Nos. 21 to 30	7,098,665	8,096,453	12.5
31	36,889	65	..
32	1,614,289	1,284,777	..
33	..	..	..
34	278,823	634,564	..
35	..	..	..
36	54,000	25,832	..
37	..	..	..
38	5,852	..	..
39	..	..	..
40	961,617	358,023	..
Total Nos. 31 to 40	2,951,470	2,303,261	3.0
Above 40	1,165,004	633,950	1.0
Wastes, etc.	823,282	1,163,361	1.5
Grand Total	52,546,165	64,044,977	100

## STATEMENT No. XIV—Showing area, production and utilization of different oilseeds in the Central Provinces and Berar.

(Average of the quinquennium ending 1942-43:  
[In tons])

Particulars	Oil seeds						Total	Cotton seed
	Linseed	Til	Groundnut	Rape and mustard	Niger	Safflower	Castor	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)
<b>Acreage</b>	..	1,153,840	469,892		Supply	23,674	28,713	3,209,343
Production	..	88,004	67,440	10,715	29,060	3,680	4,684	188,603
Stocks B. F.	..	7,500	7,920	297	3,180	400	240	17,600
Imports	..	1,095	1,848	3,178	280	..	158	158
Total Supplies	..	96,599	77,731	14,190	31,520	4,080	5,062	206,361
Exports	..	38,439	971	9,725	2,320	480	681	46,836
Net Supplies	..	58,160	76,760	4,465	29,200	3,600	4,381	159,525
Utilization								
Seed	..	7,524	11,759	394	1,340	96	339	27,867
Domestic consumption	..	300	3,166	2,781	200	..	..	122,228
Crushing purposes	..	43,156	19,302	1,033	25,520	3,104	3,842	148,892
Carry-over	..	7,180	8,900	257	2,140	400	200	9,430
Oil								
Production	..	15,752	7,234	341	6,380	621	1,076	48,873
Imports	..	140	70	330	..	145	2,270	14,498
Total Supplies	..	15,892	7,304	671	6,380	766	3,346	63,371
Exports	..	1,300	1,200	220	45	..	..	4,535
Net Supplies	..	14,592	6,104	551	6,335	766	3,346	58,836

\*The area and production of groundnut in 1944-45 are as follows (final forecast) :—

Area	..	516,993 acres.
Production	..	147,800 tons.

GPN—2132—SPIC—7-4-45—250.



STATEMENT No. XIV—Showing area, production and utilization of different oilseeds in the Central Provinces and Berar.  
(Average of the quinquennium ending 1942-43)  
[In tons]

Particulars	Oil seeds						Total	Cotton seed
	Linseed	Til	Groundnut	Rape and mustard	Niger	Safflower	Castor	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)
<b>Acres</b>	1,153,840	469,892	233,640*	63,017	290,951	23,674	28,713	3,209,343
<b>Production</b>	88,004	36,698	67,440	10,715	29,060	3,680	4,684	188,603
<b>Stocks B. F.</b>	7,500	3,320	7,920	297	2,180	400	240	17,600
<b>Imports</b>	1,095	1,848	2,371	3,178	280	..	138	158
<b>Total Supplies</b>	96,599	41,866	77,731	14,190	31,520	4,080	5,162	206,361
<b>Exports</b>	38,439	10,123	971	9,715	2,320	430	681	46,836
<b>Net Supplies</b>	58,160	31,743	76,760	4,465	29,200	3,600	4,381	159,525
<b>Seed</b>	7,524	630	11,759	394	1,340	96	339	27,867
<b>Domestic consumption</b>	300	8,571	3,166	2,781	200	..	15,018	122,228
<b>Crushing purposes</b>	43,156	19,302	52,935	1,033	25,520	3,104	3,842	..
<b>Carry-over</b>	7,180	3,240	8,900	257	2,140	400	200	9,430
<b>Production</b>	15,752	7,234	17,469	341	6,380	621	1,076	48,873
<b>Imports</b>	140	70	11,543	330	..	145	2,270	14,498
<b>Total Supplies</b>	15,892	7,304	29,012	671	6,380	766	3,346	63,371
<b>Exports</b>	1,300	1,200	1,770	220	45	..	..	4,535
<b>Net Supplies</b>	14,592	6,104	27,242	551	6,335	766	3,346	58,836

\*The area and production of groundnut in 1944-45 are as follows (final forecast) :—  
Area .. 516,993 acres.  
Production .. 147,800 tons.







